Amerian Math 2412 Final Exam Review

Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

The function f is one-to-one. Find its inverse.

1) $f(x) = 5x^2 - 8, x \geq 0$ 1) _____

A) $f^{-1}(x) = \frac{5}{\sqrt{x+8}}$

B) $f^{-1}(x) = \sqrt{\frac{5}{x+8}}$

C) $f^{-1}(x) = \sqrt{\frac{x+8}{5}}$

D) $f^{-1}(x) = -\sqrt{\frac{x+8}{5}}$

Determine i) the domain of the function, ii) the range of the function, iii) the domain of the inverse, and iv) the range of the inverse.

2) $f(x) = \sqrt{1-5x}$ 2) _____

A) f(x): $D = \left\{x \mid x \leq \frac{1}{5}\right\}$, R is all real numbers;

$f^{-1}(x)$: D is all real numbers, $R = \left\{y \mid y \leq \frac{1}{5}\right\}$

B) f(x): $D = \left\{x \mid x \leq \frac{1}{5}\right\}$, $R = \{y \mid y \leq 0\}$;

$f^{-1}(x)$: D is all real numbers, $R = \left\{y \mid y \leq \frac{1}{5}\right\}$

C) f(x): $D = \left\{x \mid x \leq \frac{1}{5}\right\}$, $R = \{y \mid y \geq 0\}$;

$f^{-1}(x)$: $D = \{x \mid x \geq 0\}$, $R = \left\{y \mid y \leq \frac{1}{5}\right\}$

D) f(x): $D = \{x \mid x \geq 0\}$, $R = \{y \mid y \geq 0\}$;

$f^{-1}(x)$: $D = \{x \mid x \geq 0\}$, $R = \left\{y \mid y \geq \frac{1}{5}\right\}$

Decide whether or not the functions are inverses of each other.

3) $f(x) = \frac{3}{x+4}$, $g(x) = \frac{4x+3}{x}$ 3) _____

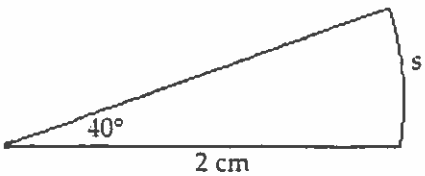
A) Yes

B) Yes; Exclude the value {-4}

C) No

Find the length s. Round the answer to three decimal places.

4) 4) _____



A) 1.117 cm B) 1.536 cm C) 1.396 cm D) 1.256 cm

(7)

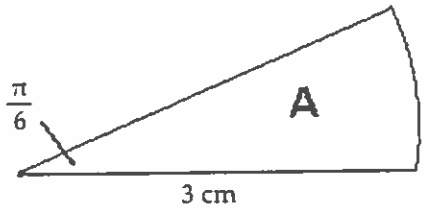
Solve the problem.

5) A ship in the Atlantic Ocean measures its position to be 20°14' north latitude. Another ship is reported to be due north of the first ship at 41°29' north latitude. Approximately how far apart are the two ships? Round to the nearest mile. Assume that the radius of the Earth is 3960 miles. 5) _____

A) 84,165 mi B) 84,150 mi C) 1484 mi D) 1469 mi

Find the area A. Round the answer to three decimal places.

6) 6) _____



A) 0.785 cm^2 B) 2.356 cm^2 C) 1.5 cm^2 D) 4.712 cm^2

Solve the problem.

7) An irrigation sprinkler in a field of lettuce sprays water over a distance of 30 feet as it rotates through an angle of 150°. What area of the field receives water? If necessary, round the answer to two decimal places. 7) _____

A) 375 ft^2 B) 39.27 ft^2 C) 1178.1 ft^2 D) 2356.19 ft^2

8) An object is traveling around a circle with a radius of 20 meters. If in 10 seconds a central angle of $\frac{1}{5}$ radian is swept out, what is the linear speed of the object? 8) _____

A) $\frac{1}{8}$ m/sec B) $\frac{2}{5}$ m/sec C) $\frac{1}{5}$ m/sec D) $\frac{1}{4}$ m/sec

In the problem, t is a real number and P = (x, y) is the point on the unit circle that corresponds to t. Find the exact value of the indicated trigonometric function of t.

9) $(\frac{\sqrt{65}}{9}, \frac{4}{9})$ Find sec t. 9) _____

A) $\frac{4\sqrt{65}}{65}$ B) $\frac{\sqrt{65}}{4}$ C) $\frac{9}{4}$ D) $\frac{9\sqrt{65}}{65}$

10) $(-\frac{\sqrt{65}}{9}, -\frac{4}{9})$ Find cot t. 10) _____

A) $\frac{\sqrt{65}}{4}$ B) $\frac{\sqrt{65}}{9}$ C) $-\frac{4\sqrt{65}}{65}$ D) $-\frac{\sqrt{65}}{4}$

Find the exact value. Do not use a calculator.

11) $\csc(-\frac{\pi}{2})$ 11) _____

A) 1 B) 0 C) -1 D) undefined

3.

Use a calculator to find the approximate value of the expression rounded to two decimal places.

12) $\cot \frac{\pi}{12}$ 12) _____

A) 3.73 B) 3.65 C) 218.93 D) 218.85

A point on the terminal side of an angle θ is given. Find the exact value of the indicated trigonometric function of θ.

13) $(-\frac{1}{5}, \frac{1}{2})$ Find $\cos \theta$. 13) _____

A) $\frac{29}{2}$ B) $-\frac{29}{5}$ C) $\frac{5\sqrt{29}}{29}$ D) $-\frac{2\sqrt{29}}{29}$

Solve the problem.

14) What is the range of the sine function? 14) _____

A) all real numbers

B) all real numbers greater than or equal to 1 or less than or equal to -1

C) all real numbers greater than or equal to 0

D) all real numbers from -1 to 1, inclusive

Use the fact that the trigonometric functions are periodic to find the exact value of the expression. Do not use a calculator.

15) $\tan \frac{17\pi}{4}$ 15) _____

A) 1 B) -1 C) $\frac{\sqrt{3}}{3}$ D) $\sqrt{3}$

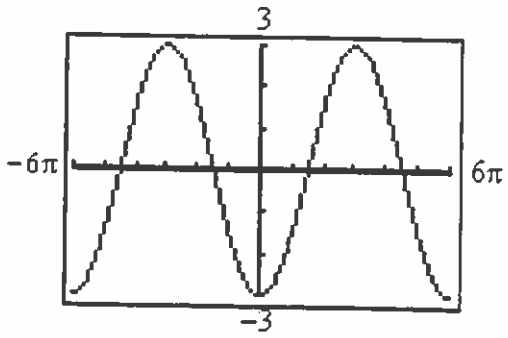
Use the even-odd properties to find the exact value of the expression. Do not use a calculator.

16) $\sin\left(-\frac{\pi}{4}\right)$ 16) _____

A) $-\frac{\sqrt{2}}{2}$ B) $\frac{\sqrt{2}}{2}$ C) $-\frac{\sqrt{3}}{2}$ D) $\frac{\sqrt{3}}{2}$

Find an equation for the graph.

17) 17) _____



A) $y = -3 \cos (3x)$ B) $y = 3 \cos\left(\frac{1}{3}x\right)$ C) $y = -3 \sin (3x)$ D) $y = -3 \cos\left(\frac{1}{3}x\right)$

Write the equation of a sine function that has the given characteristics.

18) Amplitude: 4
Period: 3π

18) _____

A) $y = \sin(3x) + 4$ B) $y = 4\sin(3x)$ C) $y = 4\sin\left(\frac{2}{3}x\right)$ D) $y = 3\sin\left(\frac{1}{2}x\right)$

Find the phase shift of the function.

19) $y = -2\sin\left(2x - \frac{\pi}{2}\right)$

19) _____

A) 2π units down B) 2π units up

C) $\frac{\pi}{4}$ units to the right D) $\frac{\pi}{2}$ units to the left

Solve the problem.

20) For the equation $y = -\frac{1}{2}\sin(4x + 3\pi)$, identify (i) the amplitude, (ii) the phase shift, and (iii) the period.

20) _____

A) (i) $-\frac{1}{2}$ (ii) $-\frac{4\pi}{3}$ (iii) 4 B) (i) 2 (ii) 3π (iii) $\frac{\pi}{2}$

C) (i) $\frac{1}{2}$ (ii) $-\frac{3\pi}{4}$ (iii) 4 D) (i) $\frac{1}{2}$ (ii) $-\frac{3\pi}{4}$ (iii) $\frac{\pi}{2}$

Find the exact value of the expression.

21) $\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$

21) _____

A) $\frac{\pi}{6}$ B) $\frac{\pi}{3}$ C) $\frac{5\pi}{6}$ D) $\frac{2\pi}{3}$

Use a calculator to find the value of the expression rounded to two decimal places.

22) $\tan^{-1}(-2.1)$

22) _____

A) -1.13 B) -25.46 C) -0.44 D) -64.54

Find the exact value of the expression. Do not use a calculator.

23) $\tan^{-1}\left[\tan\left(\frac{5\pi}{7}\right)\right]$

23) _____

A) $\frac{5\pi}{7}$ B) $\frac{2\pi}{7}$ C) $-\frac{2\pi}{7}$ D) $-\frac{5\pi}{7}$

24) $\sin^{-1}\left[\sin\left(\frac{4\pi}{5}\right)\right]$

24) _____

A) $\frac{5}{4\pi}$ B) $\frac{4\pi}{5}$ C) $\frac{5}{\pi}$ D) $\frac{\pi}{5}$

Find the exact solution of the equation.

25) $4\cos^{-1}(5x) = \pi$ 25) _____

A) $\left\{\frac{1}{10}\right\}$ B) $\left\{\frac{5\sqrt{2}}{2}\right\}$ C) $\left\{\frac{\sqrt{2}}{10}\right\}$ D) $\left\{\frac{\sqrt{3}}{10}\right\}$

Find the exact value of the expression.

26) $\tan\left[\cos^{-1}\left(-\frac{1}{2}\right)\right]$ 26) _____

A) $-\frac{\sqrt{3}}{3}$ B) $-\sqrt{3}$ C) $\sqrt{3}$ D) -1

27) $\csc^{-1}\left(\frac{2\sqrt{3}}{3}\right)$ 27) _____

A) $\frac{\pi}{3}$ B) $-\frac{\pi}{3}$ C) $\frac{2\pi}{3}$ D) $\frac{\pi}{6}$

Use a calculator to find the value of the expression in radian measure rounded to two decimal places.

28) $\cot^{-1}\left(-\frac{5}{4}\right)$ 28) _____

A) -0.90 B) -38.66 C) -51.34 D) -0.67

Solve the equation on the interval $0 \le \theta < 2\pi$.

29) $5\sqrt{2}\sin\theta + 4 = -1$ 29) _____

A) $\left\{\frac{3\pi}{4}, \frac{7\pi}{4}\right\}$ B) $\left\{\frac{5\pi}{4}, \frac{7\pi}{4}\right\}$ C) $\left\{\frac{4\pi}{3}, \frac{5\pi}{3}\right\}$ D) $\left\{\frac{7\pi}{6}, \frac{11\pi}{6}\right\}$

Use a calculator to solve the equation on the interval $0 \le \theta < 2\pi$. Round the answer to two decimal places.

30) $4\cot\theta = -3$ 30) _____

A) 2.21, 4.07 B) 2.21, 5.36 C) 2.50, 6.93 D) 2.50, 5.64

Solve the equation on the interval $0 \le \theta < 2\pi$.

31) $2\sin^2\theta - 3\sin\theta - 2 = 0$ 31) _____

A) $\left\{\frac{4\pi}{3}, \frac{5\pi}{3}\right\}$ B) $\left\{\frac{\pi}{2}, \frac{5\pi}{6}, \frac{7\pi}{6}\right\}$ C) $\left\{\frac{7\pi}{6}, \frac{11\pi}{6}\right\}$ D) $\left\{\frac{\pi}{2}, \frac{7\pi}{6}, \frac{11\pi}{6}\right\}$

32) $\cos^2\theta - \sin^2\theta = 1 + \sin\theta$ 32) _____

A) $\left\{0, \frac{\pi}{6}, \frac{5\pi}{6}, \pi\right\}$ B) $\left\{\frac{\pi}{2}, \frac{7\pi}{6}, \frac{3\pi}{2}, \frac{11\pi}{6}\right\}$

C) $\left\{0, \pi, \frac{7\pi}{6}, \frac{11\pi}{6}\right\}$ D) $\left\{0, \pi, \frac{4\pi}{3}, \frac{5\pi}{3}\right\}$

33) $(\csc\theta - 2)(\cot\theta + 1) = 0$ 33) _____

A) $\left\{\frac{3\pi}{4}, \frac{7\pi}{6}, \frac{5\pi}{4}, \frac{11\pi}{6}\right\}$ B) $\left\{\frac{\pi}{6}, \frac{3\pi}{4}, \frac{5\pi}{6}, \frac{5\pi}{4}\right\}$

C) $\left\{\frac{\pi}{6}, \frac{3\pi}{4}, \frac{5\pi}{6}, \frac{7\pi}{4}\right\}$ D) $\left\{\frac{\pi}{6}, \frac{3\pi}{4}, \frac{7\pi}{4}, \frac{11\pi}{6}\right\}$

Simplify the expression.

34) $\frac{\cos\theta}{1+\sin\theta} + \tan\theta$ 34) _____

A) $\cos\theta + \sin\theta$ B) $\sin^2\theta$ C) 1 D) $\sec\theta$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Establish the identity.

35) $\frac{1-\sec\theta}{\tan\theta} + \frac{\tan\theta}{1-\sec\theta} = -2\csc\theta$ 35) _____

36) $\frac{\csc\theta + \cot\theta}{\tan\theta + \sin\theta} = \csc\theta\cot\theta$ 36) _____

37) $\tan(\theta - \pi) = \tan\theta$ 37) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find the exact value of the expression.

38) $\sin 165°$ 38) _____

A) $\frac{\sqrt{2}(\sqrt{3}-1)}{4}$ B) $-\sqrt{2}(\sqrt{3}-1)$ C) $-\sqrt{2}(\sqrt{3}+1)$ D) $-\frac{\sqrt{2}(\sqrt{3}-1)}{4}$

39) $\cos\left(\tan^{-1}\frac{4}{3} - \sin^{-1}\frac{3}{5}\right)$ 39) _____

A) $\frac{2\sqrt{3}}{5}$ B) 1 C) $\frac{2\sqrt{6}}{5}$ D) $\frac{24}{25}$

Solve the equation on the interval $0 \le \theta < 2\pi$.

40) $\cos\theta = \sin\theta$ 40) _____

A) $\left\{\frac{3\pi}{4}, \frac{7\pi}{2}\right\}$ B) $\left\{\frac{\pi}{4}, \frac{5\pi}{4}\right\}$ C) $\left\{\frac{3\pi}{4}, \frac{5\pi}{4}\right\}$ D) $\left\{\frac{\pi}{4}, \frac{7\pi}{4}\right\}$

Use the information given about the angle θ, $0 \le \theta \le 2\pi$, to find the exact value of the indicated trigonometric function.

41) $\cos\theta = \frac{3}{5}$, $\frac{3\pi}{2} < \theta < 2\pi$ Find $\sin(2\theta)$. 41) _____

A) $-\frac{24}{25}$ B) $-\frac{7}{25}$ C) $\frac{7}{25}$ D) $\frac{24}{25}$

42) $\tan\theta = \frac{7}{24}$, $\pi < \theta < \frac{3\pi}{2}$ Find $\tan(2\theta)$. 42) _____

A) $-\frac{336}{527}$ B) $-\frac{527}{336}$ C) $\frac{527}{336}$ D) $\frac{336}{527}$

Solve the equation on the interval $0 \le \theta < 2\pi$.

43) $\sin(2\theta) + \sin\theta = 0$ 43) _____

A) $\left\{\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}\right\}$

B) No solution

C) $\left\{0, \frac{2\pi}{3}, \pi, \frac{4\pi}{3}\right\}$

D) $\left\{\frac{\pi}{8}, \frac{9\pi}{8}\right\}$

Use the information given about the angle θ, $0 \le \theta \le 2\pi$, to find the exact value of the indicated trigonometric function.

44) $\sin\theta = \frac{1}{4}$, $\tan\theta > 0$ Find $\cos\frac{\theta}{2}$. 44) _____

A) $\frac{\sqrt{10}}{4}$ B) $\frac{\sqrt{8+2\sqrt{15}}}{4}$ C) $\frac{\sqrt{8-2\sqrt{15}}}{4}$ D) $\frac{\sqrt{6}}{4}$

45) $\tan\theta = 2$, $\cos\theta < 0$ Find $\sin\frac{\theta}{2}$. 45) _____

A) $\sqrt{\frac{5-\sqrt{5}}{10}}$ B) $\sqrt{\frac{5+\sqrt{5}}{10}}$ C) $-\sqrt{\frac{1+\sqrt{5}}{10}}$ D) $-\sqrt{\frac{1-\sqrt{5}}{10}}$

Use the Half-angle Formulas to find the exact value of the trigonometric function.

46) $\cos\left(-\frac{\pi}{8}\right)$ 46) _____

A) $\frac{1}{2}\sqrt{1+\sqrt{2}}$ B) $\frac{1}{2}\sqrt{2-\sqrt{2}}$ C) $\frac{1}{2}\sqrt{1-\sqrt{2}}$ D) $\frac{1}{2}\sqrt{2+\sqrt{2}}$

47) $\sin 22.5°$ 47) _____

A) $-\frac{1}{2}\sqrt{2-\sqrt{2}}$ B) $-\frac{1}{2}\sqrt{2+\sqrt{2}}$ C) $\frac{1}{2}\sqrt{2+\sqrt{2}}$ D) $\frac{1}{2}\sqrt{2-\sqrt{2}}$

Express the product as a sum containing only sines or cosines.

48) $\sin(4\theta)\cos(2\theta)$ 48) _____

A) $\frac{1}{2}[\cos(6\theta) - \cos(2\theta)]$

B) $\frac{1}{2}[\sin(6\theta) + \cos(2\theta)]$

C) $\frac{1}{2}[\sin(6\theta) + \sin(2\theta)]$

D) $\sin\cos(8\theta^2)$

Express the sum or difference as a product of sines and/or cosines.

49) $\cos(6\theta) + \cos(4\theta)$ 49) _____

A) $2\cos(5\theta)$ B) $2\cos(5\theta)\sin\theta$ C) $2\cos(5\theta)\cos\theta$ D) $2\sin(5\theta)\sin\theta$

Find the exact value under the given conditions.

50) $\sin\alpha = \frac{15}{17}$, $\frac{\pi}{2} < \alpha < \pi$; $\cos\beta = \frac{5}{13}$, $0 < \beta < \frac{\pi}{2}$ Find $\sin(\alpha - \beta)$. 50) _____

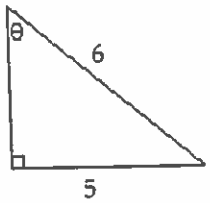
A) $-\frac{21}{221}$ B) $\frac{171}{221}$ C) $\frac{220}{221}$ D) $-\frac{140}{221}$

51) $\cos\alpha = -\frac{12}{13}, \frac{\pi}{2} < \alpha < \pi$; $\sin\beta = \frac{15}{17}, \frac{\pi}{2} < \alpha < \pi$ Find $\tan(\alpha + \beta)$. 51) _____

A) $-\frac{220}{21}$ B) $-\frac{220}{171}$ C) $\frac{20}{3}$ D) $-\frac{220}{221}$

Find the value of the indicated trigonometric function of the angle θ in the figure. Give an exact answer with a rational denominator.

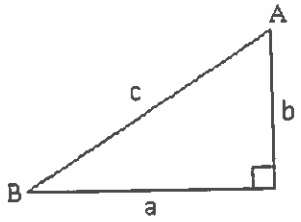
52) 52) _____



Find csc θ.

A) $\frac{6}{5}$ B) $\frac{5\sqrt{11}}{11}$ C) $\frac{6\sqrt{11}}{11}$ D) $\frac{5}{6}$

Solve the right triangle using the information given. Round answers to two decimal places, if necessary.



53) b = 5, B = 20°; Find a, c, and A. 53) _____

A) a = 13.74, c = 15.62, A = 80°
B) a = 13.74, c = 14.62, A = 70°
C) a = 13.74, c = 15.62, A = 70°
D) a = 13.74, c = 14.62, A = 80°

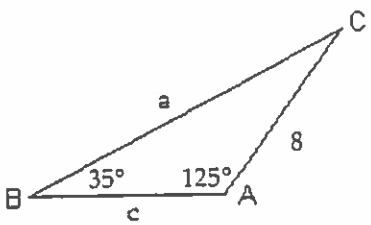
Solve the problem.

54) A radio transmission tower is 220 feet tall. How long should a guy wire be if it is to be attached 8 feet from the top and is to make an angle of 26° with the ground? Give your answer to the nearest tenth of a foot. 54) _____

A) 235.9 ft B) 483.6 ft C) 244.8 ft D) 501.9 ft

Solve the triangle.

55) 55) _____



A) C = 20°, a = 4.77, c = 11.43
B) C = 15°, a = 4.77, c = 11.43
C) C = 25°, a = 11.43, c = 4.77
D) C = 20°, a = 11.43, c = 4.77

Two sides and an angle are given. Determine whether the given information results in one triangle, two triangles, or no triangle at all. Solve any triangle(s) that results.

56) $a = 7, b = 9, B = 49°$ 56) _____

A) one triangle
$A = 76.01°, C = 54.99°, c = 7.60$

B) one triangle
$A = 35.94°, C = 95.06°, c = 11.88$

C) two triangles
$A_1 = 76.01°, C_1 = 54.99°, c_1 = 7.60$ or
$A_2 = 103.99°, C_2 = 27.01, c_2 = 12.14$

D) no triangle

57) $a = 17, b = 12, B = 10°$ 57) _____

A) two triangles
$A_1 = 14.24°, C_1 = 155.76°, c_1 = 28.37$ or
$A_2 = 165.76°, C_2 = 4.24°, c_2 = 5.11$

B) one triangle
$A = 165.76°, C = 4.24°, c = 5.11$

C) one triangle
$A = 14.24°, C = 155.76°, c = 28.37$

D) no triangle

Solve the problem.

58) An airplane is sighted at the same time by two ground observers who are 3 miles apart and both directly west of the airplane. They report the angles of elevation as 13° and 20°. How high is the airplane? 58) _____

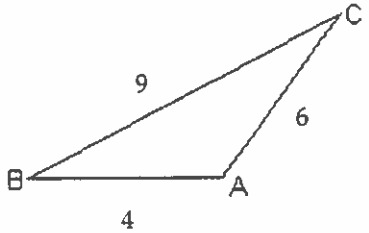
A) 1.89 mi B) 1.03 mi C) 2.88 mi D) 0.67 mi

Solve the triangle.

59) $b = 5, c = 7, A = 70°$ 59) _____

A) $a = 8.08, B = 41.6°, C = 68.4°$
B) $a = 7.08, B = 41.6°, C = 68.4°$
C) $a = 7.08, B = 68.4°, C = 41.6°$
D) $a = 6.08, B = 68.4°, C = 41.6°$

60) 60) _____



A) $A = 32.1°, B = 127.2°, C = 20.7°$
B) $A = 127.2°, B = 32.1°, C = 20.7°$
C) $A = 127.2°, B = 20.7°, C = 32.1°$
D) $A = 32.1°, B = 20.7°, C = 127.2°$

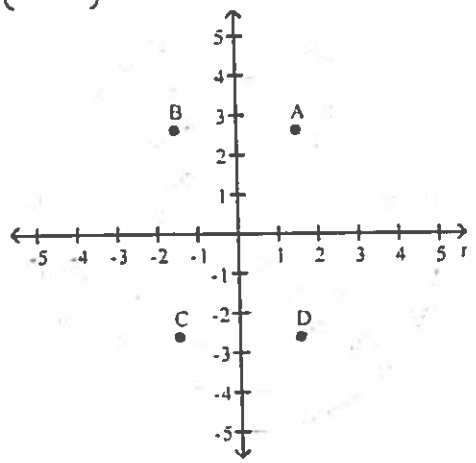
Solve the problem.

61) Two points A and B are on opposite sides of a building. A surveyor selects a third point C to place a transit. Point C is 48 feet from point A and 70 feet from point B. The angle ACB is 51°. How far apart are points A and B? 61) _____

A) 71.3 ft B) 106.9 ft C) 96.5 ft D) 54.5 ft

Match the point in polar coordinates with either A, B, C, or D on the graph.

62) $\left(-3, \frac{4\pi}{3}\right)$ 62) _____



A) A B) B C) C D) D

The polar coordinates of a point are given. Find the rectangular coordinates of the point.

63) $\left(-5, \frac{3\pi}{4}\right)$ 63) _____

A) $\left(\frac{-5\sqrt{2}}{2}, \frac{-5\sqrt{2}}{2}\right)$ B) $\left(\frac{-5\sqrt{2}}{2}, \frac{5\sqrt{2}}{2}\right)$ C) $\left(\frac{5\sqrt{2}}{2}, \frac{-5\sqrt{2}}{2}\right)$ D) $\left(\frac{5\sqrt{2}}{2}, \frac{5\sqrt{2}}{2}\right)$

The rectangular coordinates of a point are given. Find polar coordinates for the point.

64) $(-\sqrt{3}, -1)$ 64) _____

A) $\left(2, -\frac{\pi}{6}\right)$ B) $\left(2, \frac{5\pi}{6}\right)$ C) $\left(2, \frac{\pi}{6}\right)$ D) $\left(2, -\frac{5\pi}{6}\right)$

The letters x and y represent rectangular coordinates. Write the equation using polar coordinates (r, θ).

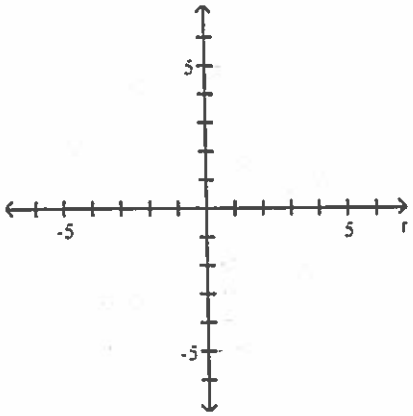
65) $x^2 + y^2 - 4x = 0$ 65) _____

A) $r \cos^2 \theta = 4 \sin \theta$ B) $r = 4 \cos \theta$

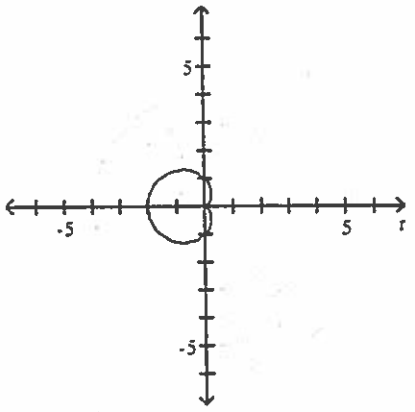
C) $r = 4 \sin \theta$ D) $r \sin^2 \theta = 4 \cos \theta$

Identify and graph the polar equation.

66) $r = 1 + \sin \theta$ 66) _____



A)



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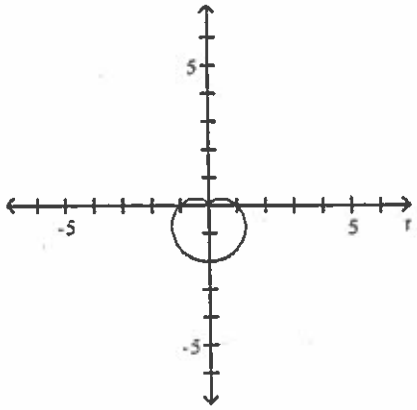
B)



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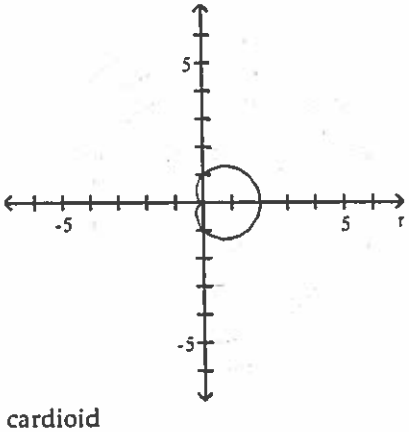
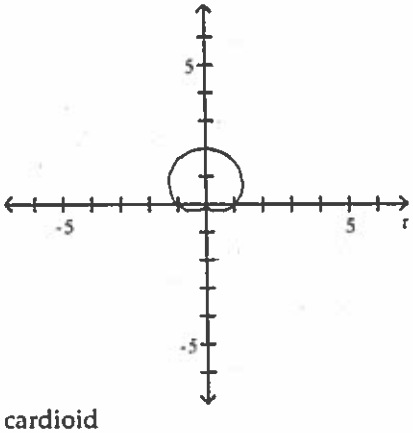
C)



cardioid

D)



cardioid

Write the complex number in polar form. Express the argument in degrees, rounded to the nearest tenth, if necessary.

67) $2 + 2i$ 67) _____

A) $2\sqrt{2}(\cos 45° + i \sin 45°)$

B) $4(\cos 30° + i \sin 30°)$

C) $2\sqrt{2}(\cos 30° + i \sin 30°)$

D) $4(\cos 45° + i \sin 45°)$

Find zw or $\frac{z}{w}$ as specified. Leave your answer in polar form.

68) $z = 2 + 2i$ 68) _____

$w = \sqrt{3} - i$

Find zw.

A) $4\left(\cos\frac{23\pi}{12} + i \sin\frac{23\pi}{12}\right)$

B) $4\left(\cos\frac{\pi}{12} + i \sin\frac{\pi}{12}\right)$

C) $4\sqrt{2}\left(\cos\frac{23\pi}{12} + i \sin\frac{23\pi}{12}\right)$

D) $4\sqrt{2}\left(\cos\frac{\pi}{12} + i \sin\frac{\pi}{12}\right)$

69) $z = 1 - i$
$w = 1 - \sqrt{3}i$
Find $\frac{z}{w}$.

69) _____

A) $\frac{\sqrt{2}}{2}(\cos 75° + i \sin 75°)$

B) $\frac{\sqrt{2}}{2}(\cos 15° + i \sin 15°)$

C) $\frac{1}{2}(\cos 15° + i \sin 15°)$

D) $\frac{1}{2}(\cos 75° + i \sin 75°)$

Write the expression in the standard form a + bi.

70) $\left[\sqrt{2}\left(\cos\frac{3\pi}{4} + i \sin\frac{3\pi}{4}\right)\right]^4$

70) _____

A) $-4i$ B) -4 C) 4 D) $4i$

71) $(-\sqrt{3} + i)^6$

71) _____

A) $-64\sqrt{3} + 64i$ B) $64 - 64\sqrt{3}i$ C) -64 D) $64i$

Find all the complex roots. Leave your answers in polar form with the argument in degrees.

72) The complex fourth roots of -16

72) _____

A) $2(\cos 45° + i \sin 45°)$, $2(\cos 135° + i \sin 135°)$, $2(\cos 225° + i \sin 225°)$, $16(\cos 315° + i \sin 315°)$

B) $16(\cos 45° + i \sin 45°)$, $16(\cos 135° + i \sin 135°)$, $16(\cos 225° + i \sin 225°)$, $16(\cos 315° + i \sin 315°)$

C) $2(\cos 90° + i \sin 90°)$, $2(\cos 180° + i \sin 180°)$, $2(\cos 270° + i \sin 270°)$, $2(\cos 360° + i \sin 360°)$

D) $\sqrt[4]{2}(\cos 45° + i \sin 45°)$, $\sqrt[4]{2}(\cos 135° + i \sin 135°)$, $\sqrt[4]{2}(\cos 225° + i \sin 225°)$, $\sqrt[4]{2}(\cos 315° + i \sin 315°)$

Find the unit vector having the same direction as v.

73) $v = 12i + 5j$

73) _____

A) $u = \frac{13}{12}i + \frac{13}{5}j$ B) $u = -\frac{5}{13}i - \frac{12}{13}j$ C) $u = 156i + 65j$ D) $u = \frac{12}{13}i + \frac{5}{13}j$

Write the vector v in the form ai + bj, given its magnitude $\|v\|$ and the angle α it makes with the positive x-axis.

74) $\|v\| = 11$, $\alpha = 60°$

74) _____

A) $v = 11\left(\frac{11\sqrt{3}}{2}i + \frac{11}{2}j\right)$

B) $v = 11\left(\frac{\sqrt{2}}{2}i + \frac{\sqrt{2}}{2}j\right)$

C) $v = 11\left(\frac{11}{2}i + \frac{11\sqrt{3}}{2}j\right)$

D) $v = 11\left(-\frac{11}{2}i - \frac{11\sqrt{3}}{2}j\right)$

Find the angle between v and w. Round your answer to one decimal place, if necessary.

75) $v = -5i + 7j$, $w = -6i - 4j$

75) _____

A) 90.9° B) 110.8° C) 20.7° D) 88.2°

Solve the problem.

76) Which of the following vectors is parallel to $v = -10i - 8j$?

76) _____

A) $w = 4i + 4j$ B) $w = 20i + 16j$ C) $w = -20i + 25j$ D) $w = 3i - 5j$

13

77) Which of the following vectors is orthogonal to $20i - 8j$? 77) _____

A) $w = -10i - 25j$ B) $w = 4i + 3j$ C) $w = 15i - 6j$ D) $w = 20i + 4j$

Solve the problem. Round your answer to the nearest tenth.

78) Find the work done by a force of 9 pounds acting in the direction of 36° to the horizontal in moving an object 5 feet from (0, 0) to (5, 0). 78) _____

A) 72.8 ft-lb B) 26.5 ft-lb C) 38.6 ft-lb D) 36.4 ft-lb

Find the position vector for the vector having initial point P and terminal point Q.

79) $P = (1, -1, 0)$ and $Q = (-4, -3, 4)$ 79) _____

A) $v = 3i - 2j - 4k$ B) $v = 5i + 2j - 4k$ C) $v = -5i - 2j + 4k$ D) $v = -4i - 2j - 5k$

Perform the indicated operation.

80) $v = 3i + 5j - 6k$ and $w = -5i + 2j + 3k$ 80) _____

Find $\|v\| - \|w\|$.

A) $5\sqrt{2} - 6$ B) $\sqrt{154}$ C) $\sqrt{70} - \sqrt{38}$ D) $3\sqrt{11}$

Find the angle between v and w. Round to one decimal place, if necessary.

81) $v = i + j$ and $w = i + j - k$ 81) _____

A) 35.3° B) 0° C) 66° D) 90°

Use the given vectors to find the indicated expression.

82) $v = 3i - 4j - 5k$, $w = 5i + 5j + 4k$ 82) _____

Find $v \times (2w)$.

A) $-7i - 49j + 50k$ B) $-18i - 6j - 70k$ C) $18i - 74j + 70k$ D) $34i - 62j + 55k$

Find the requested vector.

83) $v = 2i - 2j + k$, $u = 2i - 4j - 3k$ 83) _____

Find a vector orthogonal to both v and u.

A) $3i + 2j - 2k$ B) $19i + 14j - 6k$ C) $10i + 8j - 4k$ D) $-3i - 2j + 2k$

Find the area of the parallelogram.

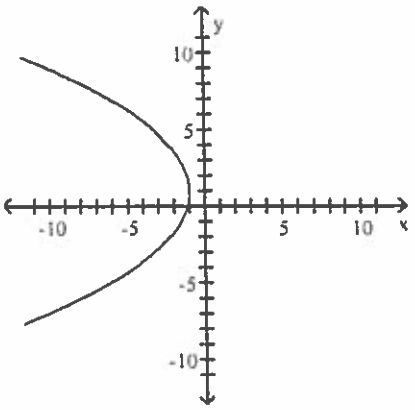
84) P_1 (0, 0, 0), P_2 (4, 2, 1), P_3 (-3, 3, 1) 84) _____

A) $\sqrt{19}$ B) $\sqrt{339}$ C) $\sqrt{21}$ D) $\sqrt{374}$

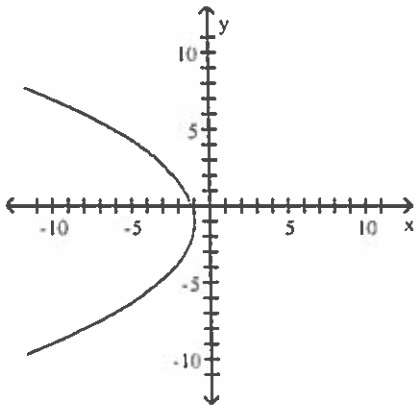
Match the equation to the graph.

85) $(y - 1)^2 = -7(x + 1)$ 85) _____

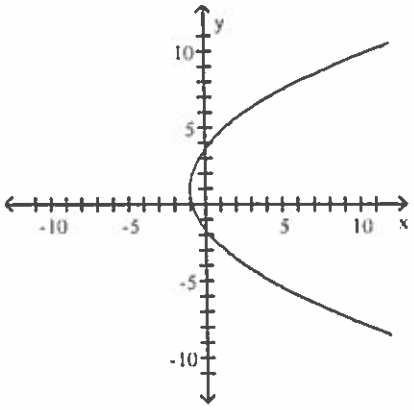
A)



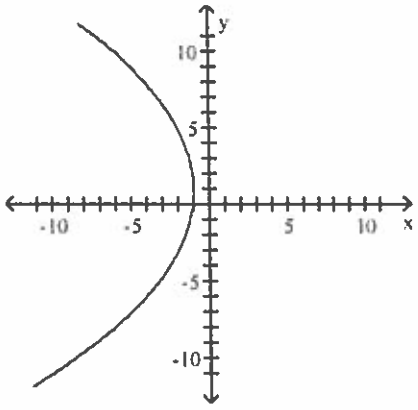
B)



C)



D)



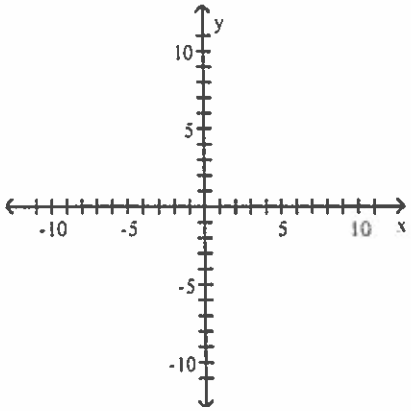
Solve the problem.

86) A reflecting telescope contains a mirror shaped like a paraboloid of revolution. If the mirror is 22 inches across at its opening and is 4 feet deep, where will the light be concentrated? 86) _____

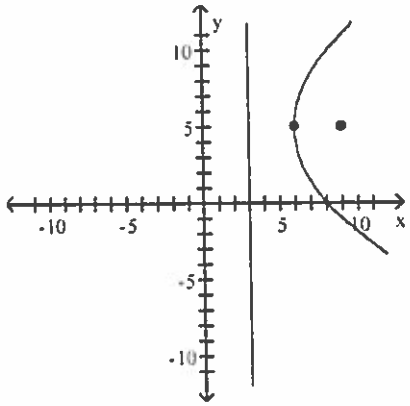
A) 7.6 in. from the vertex
B) 0.6 in. from the vertex
C) 0.7 in. from the vertex
D) 0.4 in. from the vertex

Find the vertex, focus, and directrix of the parabola. Graph the equation.

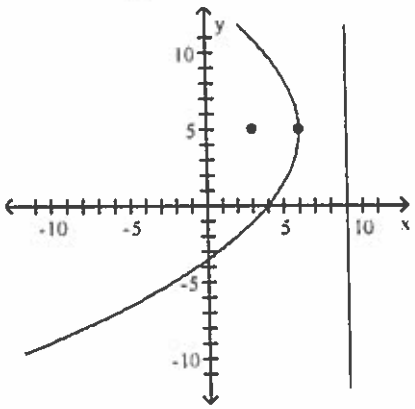
87) $x^2 - 12x = 12y - 96$ 87) _____



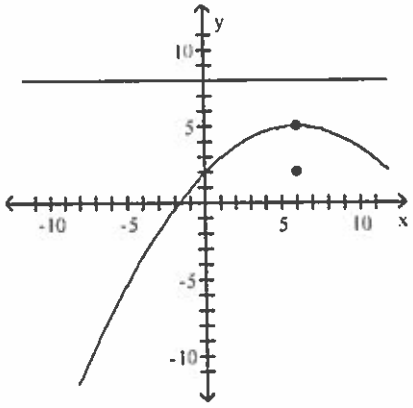
A) vertex: (6, 5)
focus: (9, 5)
directrix: x = 3



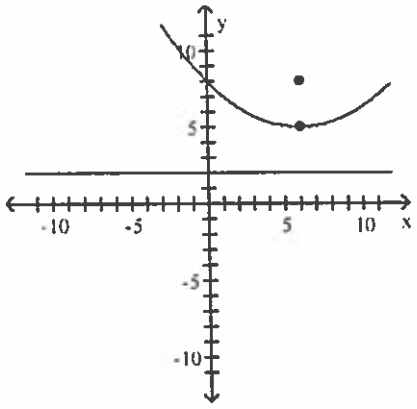
B) vertex: (6, 5)
focus: (3, 5)
directrix: x = 9



C) vertex: (6, 5)
focus: (6, 2)
directrix: y = 8



D) vertex: (6, 5)
focus: (6, 8)
directrix: y = 2



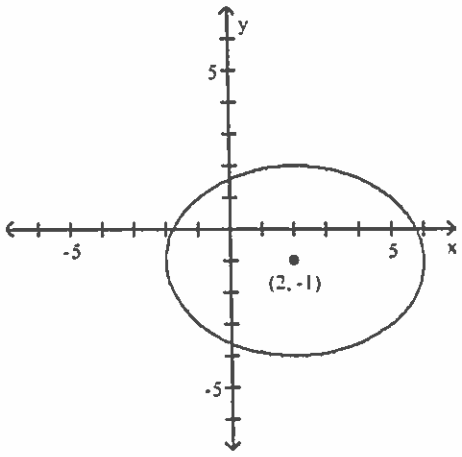
Find an equation for the ellipse described.

88) Focus at (-3, 0); vertices at (±4, 0) 88) _____

A) $\frac{x^2}{7} + \frac{y^2}{16} = 1$ B) $\frac{x^2}{16} + \frac{y^2}{7} = 1$ C) $\frac{x^2}{9} + \frac{y^2}{16} = 1$ D) $\frac{x^2}{9} + \frac{y^2}{7} = 1$

Write an equation for the graph.

89) 89) _____



A) $\frac{(x-2)^2}{9}+\frac{(y+1)^2}{16}=1$

B) $\frac{(x+1)^2}{16}+\frac{(y-2)^2}{9}=1$

C) $\frac{(x-2)^2}{16}+\frac{(y+1)^2}{9}=1$

D) $\frac{(x+2)^2}{16}+\frac{(y-1)^2}{9}=1$

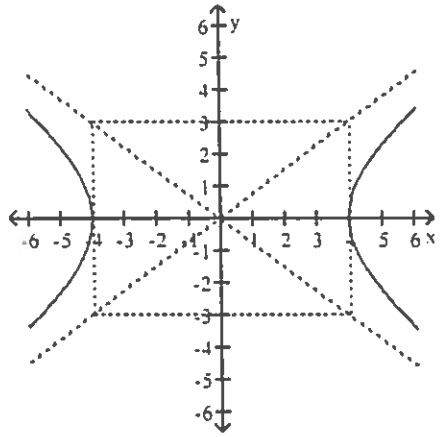
Find an equation for the hyperbola described.

90) Vertices at (0, ±10); asymptotes at $y=\pm\frac{5}{3}x$ 90) _____

A) $\frac{y^2}{100}-\frac{x^2}{9}=1$ B) $\frac{y^2}{36}-\frac{x^2}{100}=1$ C) $\frac{y^2}{9}-\frac{x^2}{25}=1$ D) $\frac{y^2}{100}-\frac{x^2}{36}=1$

Write an equation for the hyperbola.

91) 91) _____



A) $\frac{x^2}{16}-\frac{y^2}{9}=1$ B) $\frac{y^2}{9}-\frac{x^2}{16}=1$ C) $\frac{x^2}{9}-\frac{y^2}{16}=1$ D) $\frac{y^2}{16}-\frac{x^2}{9}=1$

17.

Find the asymptotes of the hyperbola.

92) $y^2 - x^2 = 16$ 92) _____

A) $y = x$ and $y = -x$

B) $y = 4x$ and $y = -4x$

C) $y = \frac{1}{16}x$ and $y = -\frac{1}{16}x$

D) $y = \frac{1}{4}x$ and $y = -\frac{1}{4}x$

Find an equation for the hyperbola described.

93) Vertices $(\frac{1}{2}, -3)$ and $(-\frac{9}{2}, -3)$; asymptotes $y + 3 = \pm\frac{6}{5}(x + 2)$ 93) _____

A) $\frac{4(x-2)^2}{25} - \frac{(y-3)^2}{9} = 1$

B) $\frac{4(x+2)^2}{25} - \frac{(y+3)^2}{9} = 1$

C) $\frac{(y+3)^2}{9} - \frac{4(x+2)^2}{25} = 1$

D) $\frac{(x+2)^2}{9} - \frac{4(y+3)^2}{25} = 1$

Identify the equation without completing the square.

94) $4x^2 + 3y^2 + 7x - 3y = 0$ 94) _____

A) hyperbola B) ellipse C) parabola D) not a conic

Determine the appropriate rotation formulas to use so that the new equation contains no xy-term.

95) $x^2 + 2xy + y^2 - 8x + 8y = 0$ 95) _____

A) $x = \frac{1}{2}x' - \frac{\sqrt{3}}{2}y'$ and $y = \frac{\sqrt{3}}{2}x' + \frac{1}{2}y'$

B) $x = \frac{\sqrt{2}}{2}(x' - y')$ and $y = \frac{\sqrt{2}}{2}(x' + y')$

C) $x = \frac{\sqrt{2+\sqrt{2}}}{2}x' - \frac{\sqrt{2-\sqrt{2}}}{2}y'$ and $y = \frac{\sqrt{2-\sqrt{2}}}{2}x' + \frac{\sqrt{2+\sqrt{2}}}{2}y'$

D) $x = -y'$ and $y = x'$

Rotate the axes so that the new equation contains no xy-term. Discuss the new equation.

96) $x^2 + 2xy + y^2 - 8x + 8y = 0$ 96) _____

A) $\theta = 36.9°$

$\frac{x'^2}{4} + \frac{y'^2}{2} = 1$

ellipse
center (0, 0)
major axis is x'-axis
vertices at (±2, 0)

B) $\theta = 36.9°$

$\frac{x'^2}{4} + \frac{y'^2}{4} = 1$

ellipse
center (0, 0)
major axis is x'-axis
vertices at (±2, 0)

C) $\theta = 45°$

$x'^2 = -4\sqrt{2}y'$

parabola
vertex at (0, 0)
focus at $(0, -\sqrt{2})$

D) $\theta = 45°$

$y'^2 = -4\sqrt{2}x'$

parabola
vertex at (0, 0)
focus at $(-\sqrt{2}, 0)$

Identify the equation without applying a rotation of axes.

97) $3x^2 + 12xy + 2y^2 - 3x - 2y + 5 = 0$ 97) _____

A) parabola B) hyperbola C) ellipse D) not a conic

98) $x^2 + 12xy + 36y^2 - 4x + 3y - 10 = 0$ 98) _____

A) ellipse B) hyperbola C) parabola D) not a conic

19

1) C
2) C
3) C
4) C
5) D
6) B
7) C
8) B
9) D
10) A
11) C
12) A
13) D
14) D
15) A
16) A
17) D
18) C
19) C
20) D
21) C
22) A
23) C
24) D
25) C
26) B
27) A
28) D
29) B
30) B
31) C
32) C
33) C
34) D

35) $\frac{1-\sec\theta}{\tan\theta}+\frac{\tan\theta}{1-\sec\theta}=\frac{(1-\sec\theta)^2+\tan^2\theta}{\tan\theta(1-\sec\theta)}=\frac{1-2\sec\theta+\sec^2\theta+\tan^2\theta}{\tan\theta(1-\sec\theta)}=\frac{2\sec^2\theta-2\sec\theta}{\tan\theta(1-\sec\theta)}=\frac{2\sec\theta(\sec\theta-1)}{\tan\theta(1-\sec\theta)}=-\frac{2\sec\theta}{\tan\theta}=-\frac{2}{\cos\theta}\cdot\frac{\cos\theta}{\sin\theta}=-\frac{2}{\sin\theta}=-2\csc\theta$

36) $\frac{\csc\theta+\cot\theta}{\tan\theta+\sin\theta}=\frac{\frac{1}{\sin\theta}+\frac{\cos\theta}{\sin\theta}}{\frac{\sin\theta}{\cos\theta}+\sin\theta}=\frac{\frac{1+\cos\theta}{\sin\theta}}{\frac{\sin\theta+\sin\theta\cos\theta}{\cos\theta}}=\frac{1+\cos\theta}{\sin\theta}\cdot\frac{\cos\theta}{\sin\theta(1+\cos\theta)}=\frac{1}{\sin\theta}\cdot\frac{\cos\theta}{\sin\theta}=\csc\theta\cot\theta$

37) $\tan(\theta-\pi)=\frac{\tan\theta-\tan\pi}{1+\tan\theta\tan\pi}=\frac{\tan\theta-0}{1+\tan\theta\cdot 0}=\tan\theta$

38) A
39) D
40) B
41) A

2d

42) D
43) C
44) B
45) B
46) D
47) D
48) C
49) C
50) B
51) A
52) A
53) B
54) B
55) D
56) B
57) A
58) A
59) B
60) B
61) D
62) A
63) C
64) D
65) B
66) D
67) A
68) D
69) B
70) B
71) C
72) A
73) D
74) C
75) D
76) B
77) A
78) D
79) C
80) C
81) A
82) C
83) C
84) D
85) A
86) B
87) D
88) B
'9) C
D

21

92) A
93) B
94) B
95) B
96) C
97) B
98) C