1. Find the equation whose graph is symmetric with respect to the the origin.

   [A] $5x^2 + 2y^2 = 10$ [B] $y = x^3 - 20$ [C] $y^3 = 5x^4 - 2$ [D] $x = |y - 20|$

   [1] _____

2. Find an equation of a circle in standard form where $C(-2, -1)$ and $D(10, 5)$ are endpoints of a diameter.

   [2] _____

3. Find the center and radius of $x^2 + y^2 + 6x + 10y + 25 = 0$.   [3] _____

   [A] center $(3, 5)$; $r = 9$ [B] center $(-3, -5)$; $r = 3$

   [C] center $(-3, -5)$; $r = 9$ [D] center $(3, 5)$; $r = 3$

4. For the data given, use a graphing utility to find the equation of the line of best fit.

x	1	2	6	7	9
y	4	3	4	6	8

   [4] _____

5. Use a graphing utility to approximate the solutions. Express the answer correct to two decimal places.
   $$x^3 + 3.5x^2 - 11.42x - 25.35 = 0$$

   [5] _____

6. Solve by using the quadratic formula: $x^2 - 3x + 1 = 0$ [6] _____

   [A] $\dfrac{3 + \sqrt{13}}{2}, \dfrac{3 - \sqrt{13}}{2}$ [B] $\dfrac{3 + \sqrt{5}}{2}, \dfrac{3 - \sqrt{5}}{2}$

   [C] $\dfrac{-3 + \sqrt{5}}{2}, \dfrac{-3 - \sqrt{5}}{2}$ [D] $\dfrac{-3 + \sqrt{13}}{2}, \dfrac{-3 - \sqrt{13}}{2}$

7. Arlene purchased some municipal bonds yielding 10% annually and some certificates of deposit yielding 12% annually. If Arlene's investment amounts to $17,000 and the annual income is $1980, how much money is invested in bonds and how much is invested in certificates of deposit?

   [A] $3500 in bonds; $13,500 in certificates of deposit

   [B] $13,500 in bonds; $3500 in certificates of deposit

   [C] $3000 in bonds; $14,000 in certificates of deposit

   [D] $14,000 in bonds; $3000 in certificates of deposit

   [7] _____

8. How many gallons of a 50% salt solution must be mixed with 30 gallons of a 15% solution to obtain a solution that is 40% salt?

   [8] _____

9. Manuel can paint a fence in 12 h and Cynthia can paint the same fence in 13 h. How long will they take to paint the fence if they work together?

[A] $6\frac{1}{26}$ h   [B] $12\frac{1}{2}$ h   [C] $6\frac{6}{25}$ h   [D] $6\frac{1}{4}$ h

[9] _____

10. Solve graphically: $|x-9| \le 4$

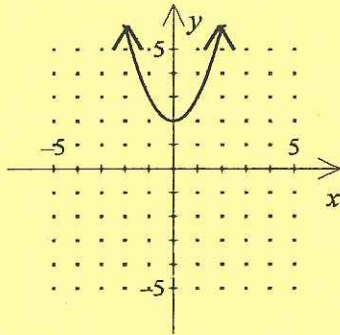[A] $\{9\}$ [B] No solution   [C] $\{x|\ 5 \le\ x\ \le 13\}$ [D] $\{x|\ x \le 5 \text{ or } x \ge 13\}$

[10] _____

11. Determine the domain of the function $h(x) = \dfrac{9x}{x(x^2 - 4)}$.

[11] _____

12. Find the domain and range for the function graphed below.

[A] $D = \{x|x \text{ is a real number}\}$
    $R = \{y|y \text{ is a real number}\}$

[B] $D = \{x|x \le 2\}$
    $R = \{y|y \text{ is a real number}\}$

[C] $D = \{x|x \text{ is a real number}\}$
    $R = \{y|y \ge 2\}$

[D] $D = \{x|x > 2\}$
    $R = \{y|y > 2\}$

[12] _____

13. Find the average rate of change of f between 1 and x, $\dfrac{f(x) - f(1)}{x - 1}$, $x \ne 1$. Be sure to simplify.

$f(x) = \sqrt{x}$

[13] _____

14. Determine where $f(x) = 12x^3 + 12x^2 - 12x + 7$ has any local maximum or local minimum values and the intervals where the function is increasing, decreasing, and constant.

use interval
notation   [14] _____

15. Which of the following functions is even?   [15] _____

   [A] $f(x) = -6x^4 - 6x^2 + 9$ [B] $h(x) = -5x^5 - 6x^3$

   [C] $F(x) = \dfrac{-6x^3}{-6x^2 - 5}$ [D] $g(x) = |-6x + 2| - 6$

16. Which of the following functions is odd?

   [A] $h(x) = 2x^3 - 6x$ [B] $F(x) = |2x+1| - 2$ [C] $g(x) = 2x^4 - 6x^2$ [D] $f(x) = -3x^4 - 6x^2$
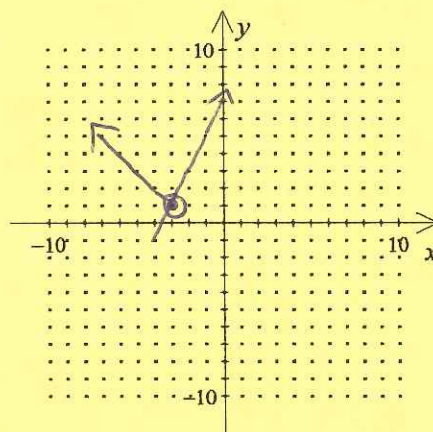
                                                                                 [16] _____

17. Is the following function an even function, an odd function, or neither?

   $f(x) = -2x^3 + 2x + 2$

                                 [17] _____

18. Graph the piecewise defined function: $f(x) = \begin{cases} -x-2 & \text{if } x < -3 \\ 2x+7 & \text{if } x \geq -3 \end{cases}$

   $^-X-2 \quad x<-3$

   $2x+7 \quad x\geq-3$

                                 [18] _____

19. The graph of which function y_2 below is the reflection of the graph of $y_1 = x^4 + x$ across the y-axis?

   [A] $y_2 = -(x^4 + x)$ [B] $y_2 = -(x^4 - x)$ [C] $y_2 = -x^4 + x$ [D] $y_2 = x^4 - x$

                                                                                 [19] _____

20. The graph of which function y_2 below is the reflection of the graph of $y_1 = x + 1$ across the x-axis?

   [A] $y_2 = -x + 1$ [B] $y_2 = x - 1$ [C] $y_2 = -(x+1)$ [D] $y_2 = -(-x-1)$

                                                                                 [20] _____

21. Given $f(x) = \dfrac{x-4}{x}$ and $g(x) = x^2 - 7$, find $(g \circ f)(-1)$.

   [A] $\dfrac{5}{3}$ [B] 18   [C] -2 [D] $-\dfrac{174}{25}$

                                                                                 [21] _____

22. If $f(x) = x^2$ and $g(x) = 3 + 4x$, find $(g \circ f)(x)$ and find the domain of $(g \circ f)(x)$.

$3 + 4x^2$

[22] _____

23. Let $P = (x, y)$ be a point on the graph of $y = x + 3$. Express the distance d from P to the point $(3, -2)$ as a function of x.

[A] $d = x^2 + 18$ [B] $d = \sqrt{2x^2 + 4x + 34}$ [C] $d = 2x^2 + 4x + 34$ [D] $d = \sqrt{x^2 + 18}$

[23] _____

24. The price p and x, the quantity of a certain product sold, obey the demand equation $p = -\frac{1}{3}x + 100$, $0 \leq x \leq 300$.
a. Express the revenue R as a function of x.
b. What is the revenue if 100 units are sold?
c. Graph the revenue function using a graphing utility.
d. What quantity x maximizes revenue? What is the maximum revenue?
e. What price should the company charge to maximize revenue?

[24] _____

25. A farmer has available 2944 feet of fencing and wishes to enclose a rectangular area. If x represents the width of the rectangle, for what value of x is the area largest?

[A] 737 feet   [B] 734.5 feet   [C] 735 feet   [D] 736 feet

[25] _____

26. Show that f and g are inverse functions or state that they are not.

$f(x) = \sqrt{6x - 7}; \quad g(x) = \frac{x^2 + 7}{6}$

[26] _____

27. Determine the equation for the inverse function of $y = (x - 6)^3 + 5$.

[A] $y = \sqrt[3]{x - 5} + 6$ [B] $y = \sqrt[3]{x - 11}$ [C] $y = \sqrt[3]{x + 6} - 5$ [D] $y = \sqrt[3]{x} + 1$

[27] _____

28. For a circle of radius 4 feet, find the arc length s subtended by a central angle of $60°$. Round to the nearest hundredth.

[28] _____

29. An object is traveling around a circle with a radius of 15 meters. If in 20 seconds a central angle of $\frac{1}{5}$ radian is swept out, what is the linear speed of the object?

[29] _____

30. Find $\cos \theta$ if $(15, -8)$ is a point on the terminal side of θ.

[30] _____

31. What is the domain and range of $f(t) = \sin t$?

[31] _____

32. Given $\sin \theta = \dfrac{1}{4}$ and $\sec \theta < 0$, find $\cos \theta$ and $\tan \theta$.

[32] _____

33. Given $\sin \theta = \dfrac{2}{5}$ and $\sec \theta < 0$, find $\cos \theta$ and $\tan \theta$.

[A] $\cos \theta = -\sqrt{21}$, $\tan \theta = -\dfrac{5}{\sqrt{21}}$ 　　　　 [B] $\cos \theta = -\dfrac{\sqrt{21}}{5}$, $\tan \theta = \dfrac{2}{\sqrt{21}}$

[C] $\cos \theta = -\dfrac{\sqrt{21}}{5}$, $\tan \theta = -\dfrac{2}{\sqrt{21}}$ 　　　　 [D] $\cos \theta = \dfrac{\sqrt{21}}{5}$, $\tan \theta = \dfrac{2}{\sqrt{21}}$

[33] _____

34. Find the exact value of $\tan\left(-\dfrac{1}{4}\pi\right)$.

$\sqrt{}\!-4$

[34] _____

35. If $\cot \theta = \dfrac{1}{4}$, find the exact value of:

(a) $\tan(90° - \theta)$
(b) $\tan(\pi/2 - \theta)$

[35] _____

36. If $\cos \theta = \dfrac{1}{3}$, find the exact value of:

(a) $\sin(\pi/2 - \theta)$
(b) $\csc(90° - \theta)$

[36] _____

37. If $\sec \theta = 2$, find the exact value of: $\sec \theta + \csc(90° - \theta)$

[A] –2.19 　　　　 [B] –0.19 　　　　 [C] 4 　　　　 [D] 2

[37] _____

38. Evaluate: $\sin \dfrac{5}{3}\pi$ 　　 [A] $-\dfrac{1}{2}$ 　　 [B] $\dfrac{\sqrt{3}}{2}$ 　　 [C] $-\dfrac{\sqrt{3}}{2}$ 　　 [D] $\dfrac{1}{2}$

[38] _____

39. Graph $y = 2 \cos \left(x + \dfrac{\pi}{2}\right)$ on the interval $-\pi \leq x \leq \pi$.

[A]
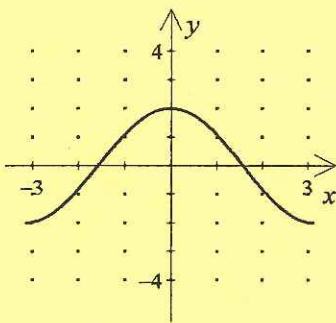
[B]
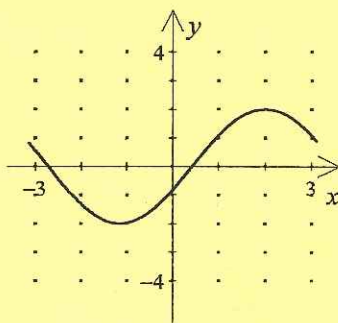
[C]
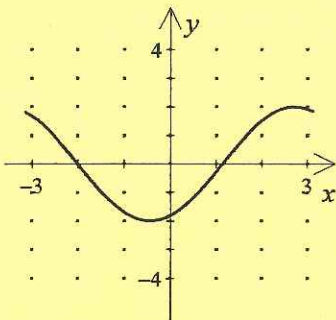
[D]
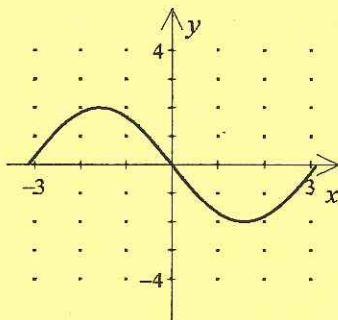
[39] _____

40. Find the exact value of $\tan\left(\cos^{-1}\left(\dfrac{\sqrt{3}}{2}\right)\right)$

[40] _____

41. Find the exact value of $\tan\left(\sin^{-1}\left(\dfrac{1}{2}\right)\right)$ [A] $-\dfrac{\sqrt{3}}{3}$ [B] $\dfrac{\sqrt{3}}{2}$ [C] $\sqrt{3}$ [D] $\dfrac{\sqrt{3}}{3}$

[41] _____

42. You are flying a kite and want to know its angle of elevation. The string on the kite is 33 meters long and the kite is level with the top of a building that you know is 26 meters high. Use an inverse trigonometric function to find the angle of elevation of the kite. Round to two decimal places.

[42] _____

43. Find two values of θ for the trigonometric equation $\cos \theta = 0.5878$. Round your answer to the nearest degree.

[A] 54°, 306°   [B] 126°, 234°   [C] 234°, 306°   [D] 54°, 126°

[43] _____

44. Find two values of θ for the trigonometric equation $\sin \theta = 0.9744$. Round your answer to the nearest degree.

   [A] $257°$, $283°$ [B] $77°$, $257°$ [C] $77°$, $103°$ [D] $103°$, $283°$

   [44] _____

45. Is the statement an identity? $\tan x + \cot x = \dfrac{1}{\sin x \cos x}$

   [45] _____

46. If $\sin A = \dfrac{3}{7}$, $\dfrac{\pi}{2} \leq A \leq \pi$, and $\cos B = -\dfrac{5}{8}$, $\pi \leq B \leq \dfrac{3\pi}{2}$, find the exact value of $\cos(A + B)$.

   [A] $\dfrac{1}{56}\left(10\sqrt{10} - 3\sqrt{39}\right)$ [B] $\dfrac{1}{56}\left(3\sqrt{39} - 10\sqrt{10}\right)$ [C] $\dfrac{1}{56}\left(10\sqrt{10} + 3\sqrt{39}\right)$ [D] $-\dfrac{11}{56}$

   [46] _____

47. Establish the identity $\cos(\theta + 2\pi) = \cos \theta$.

   [47] _____

48. $\sin(\theta + 2\pi)$ forms an identity with which of the following?

   [A] $-\sin \theta$ [B] $-\cos \theta$ [C] $\sin \theta$ [D] $\cos \theta$

   [48] _____

49. If $\cos \theta = \dfrac{4}{5}$ and θ terminates in the first quadrant, find the exact value of $\sin 2\theta$.

   [49] _____

50. Find the exact value of $\sin 2B$ if $\sin B = -\dfrac{5}{13}$ and B lies in quadrant IV.

   [A] $\dfrac{119}{169}$ [B] $\dfrac{120}{169}$ [C] $-\dfrac{120}{169}$ [D] $-\dfrac{119}{169}$

   [50] _____

51. $\csc 2\theta + \cot 2\theta$ forms an identity with which of the following?

   [A] $\cot \theta$ [B] $\cot \dfrac{\theta}{2}$ [C] $\tan \dfrac{\theta}{2}$ [D] $\tan \theta$

   [51] _____

52. Find the exact value of $\cos 75°$.

   [52] _____

53. Solve the equation $-1 + 13\sin x = 20\cos^2 x$, where $0° \leq x \leq 360°$.

   [53] _____

54. A tree casts a shadow of 24 meters when the angle of elevation of the sun is 26°. Find the height of the tree to the nearest meter.

[54] _____

55. A photographer points a camera at a window in a nearby building forming an angle of 48° with the camera platform. If the camera is 51 m from the building, how high above the platform is the window, to the nearest hundredth?
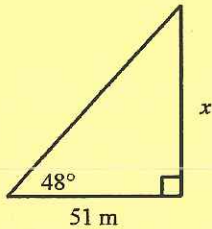
[A] 1.11 m   [B] 45.92 m   [C] 0.9 m   [D] 56.64 m

[55] _____

56. Given a triangle with $a = 1$, $\alpha = 40°$ and $\beta = 28°$, what is the length of c? Round your answer to two decimal places.

[56] _____

57. Given a triangle with $a = 9$, $b = 10$, and $\alpha = 39°$, what is (are) possible length(s) of c? Round your answer to two decimal places.

[57] _____

58. Solve the triangle given that $a = 10$, $b = 18$, and $c = 14$.

[58] _____

59. Find the area of the triangle with $\alpha = 140°$, $b = 3$ feet, and $c = 2$ feet. Round your answer to two decimal places.

[59] _____

60. Find the area of a triangle with sides 7 m, 8 m, and 11 m. Round to the nearest hundredth.

[60] _____

Exam

Name_____

Find an equation for the graph.

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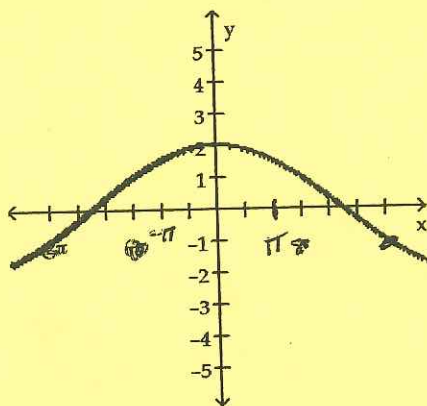
A) $y = 3 \cos (2x)$ B) $y = 2 \cos (3x)$ C) $y = 3 \cos\left(\frac{1}{2}x\right)$ D) $y = 2 \cos\left(\frac{1}{3}x\right)$

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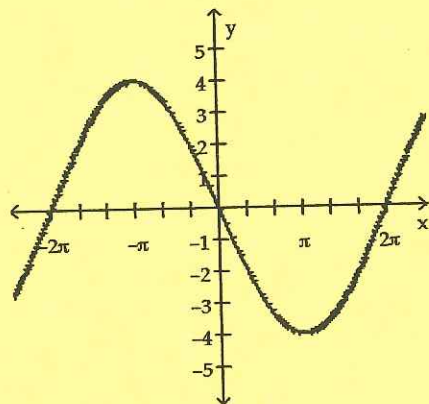
A) $y = -4 \sin (2x)$ B) $y = -4 \cos\left(\frac{1}{2}x\right)$ C) $y = -4 \sin\left(\frac{1}{2}x\right)$ D) $y = -4 \cos (2x)$

Find the amplitude, period, and phase shift of the sinusoidal funtion.

3) $y = -\frac{3}{4} \sin \left(\frac{1}{4}x + \frac{\pi}{2}\right)$

A) amplitude $= -\frac{3}{4}$; period $= 8\pi$; phase shift $= -2\pi$

B) amplitude $= \frac{3}{4}$; period $= 8\pi$; phase shift $= -2\pi$

C) amplitude $= \frac{3}{4}$; period $= 8\pi$; phase shift $= 2\pi$

D) amplitude $= \frac{3}{4}$; period $= \frac{\pi}{2}$; phase shift $= -2\pi$

1

Graph the sinusoidal function over one complete period.

4) $y = 3 \sin \left(\frac{1}{2}x + \frac{\pi}{4} \right)$
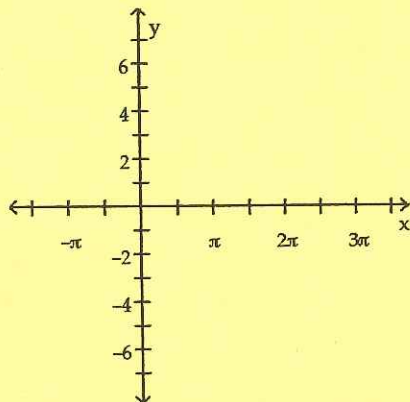

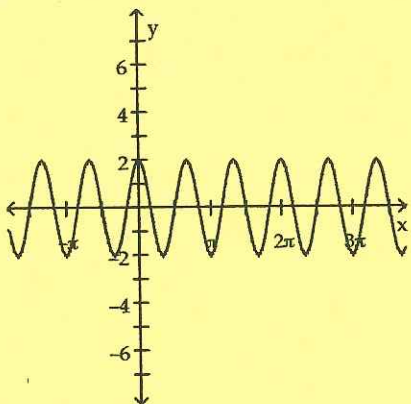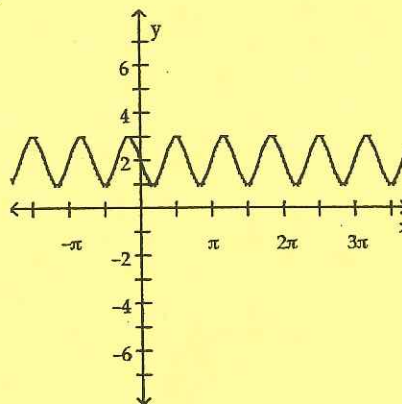A)

B)

C)

D)

2
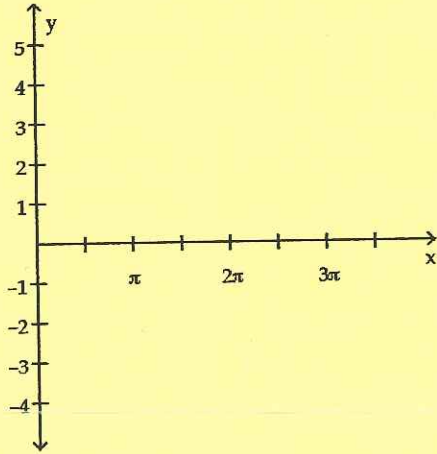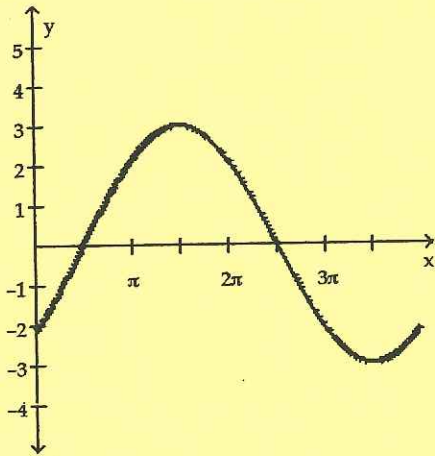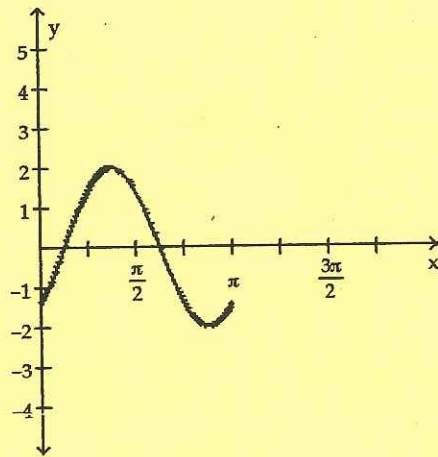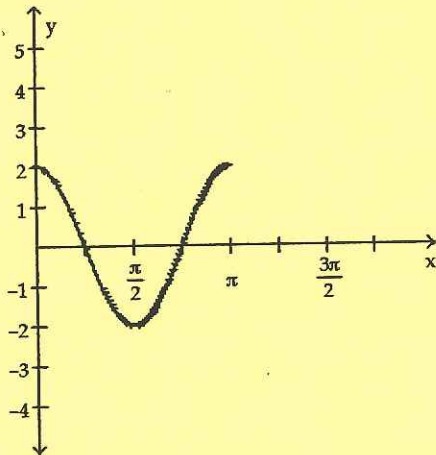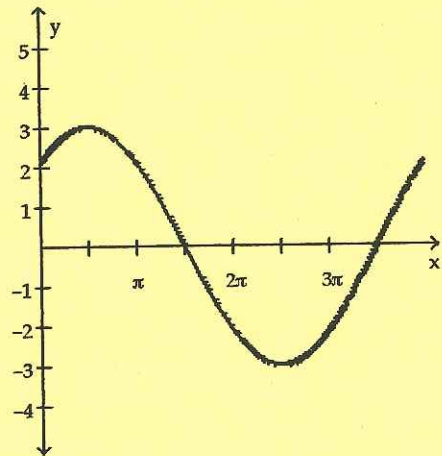
Graph the function. Show at least one period.

5) $y = 2\cos\left(3x + \dfrac{\pi}{2}\right)$
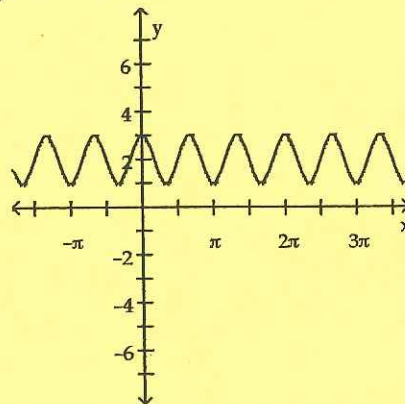

A)

B)

C)
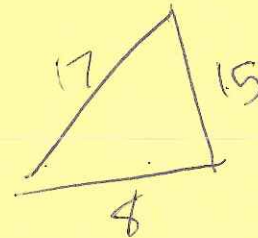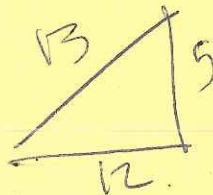

D)
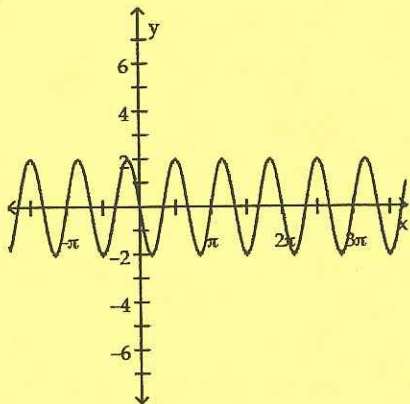
Both angles A and B are _first quadrant angles_. Use the following information to find the EXACT values indicated. Your answers must be in fraction/radical form. Decimal answers will not be accepted. (each part is 2 points)

$\sin A = \dfrac{5}{13}$ $\cos B = \dfrac{8}{17}$

Find these values:

_____ A. $\tan B$

_____ B. $\cos A$

_____ C. $\cos(A - B)$

_____ D. $\sin 2A$

[1] A

[2] $(x-4)^2 + (y-2)^2 = 45$

[3] B

[4] $y = 0.500x + 2.500$

[5] $\{-4.78, -1.75, 3.03\}$

[6] B

[7] C

[8] 75 gallons

[9] C

[10] C

[11] $\{x \mid x \neq \pm 2, x \neq 0\}$

[12] C   in interval notation

D: $(-\infty, \infty)$
R: $[2, \infty)$

[13] $\dfrac{\sqrt{x} - 1}{x - 1}$

local maximum at $x = -1$

local minimum at $x = \dfrac{1}{3}$

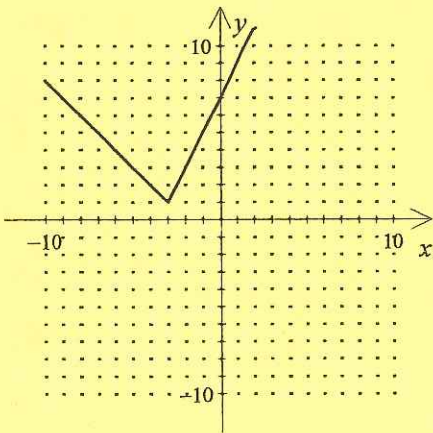Increasing on the intervals $(-\infty, -1)$ and $(\dfrac{1}{3}, \infty)$ ← this is interval notation

Decreasing on the interval $(-1, \dfrac{1}{3})$

[14]

[15] A

[16] A

[17] neither
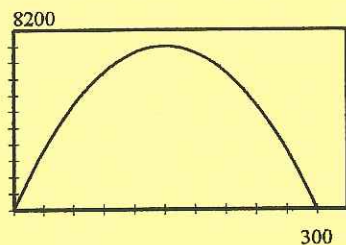

[18]

[19] D

[20] C

[21] B

[22] $(g \circ f)(x) = (3 + 4x^2)$; Domain: all real numbers

[23] B

    a. $R = -\dfrac{1}{3}x^2 + 100x$

    b. $R(100) = \$6666.67$

    c.

    d. 150; $7500.00

[24]   e. 50.00

[25] D

[26] Inverses. Check to see that $f(g(x)) = g(f(x))$ and that $g(f(x)) = f(g(x))$

[27] A

[28] 4.19 feet

[29] $\dfrac{3}{20}$ $\dfrac{\text{meters}}{\text{second}}$ $= .15 m/sec$

[30] $\dfrac{15}{17}$

[31] D: $-\infty < t < \infty$
    R: $-1 \leq f(t) \leq 1$

[32] $\cos\theta = -\dfrac{\sqrt{15}}{4}$, $\tan\theta = -\dfrac{1}{\sqrt{15}} = \dfrac{-\sqrt{15}}{15}$

[33] C

[34] -1

[35] (a) $\dfrac{1}{4}$ (b) $\dfrac{1}{4}$

[36] (a) $\dfrac{1}{3}$ (b) 3

[37] C

[38] C

[39] D

[40] $\dfrac{\sqrt{3}}{3}$

[41] D

[42] 51.99°

[43] A

[44] C

[45] Yes

[46] C

[47] $\cos(\theta + 2\pi) = \cos\theta \, \cos2\pi - \sin\theta \, \sin2\pi = \cos\theta \cdot (1) - \sin\theta \cdot (0) = \cos\theta$

[48] C

[49] $\dfrac{24}{25}$

[50] C

[51] A

[52] $\dfrac{\sqrt{2 - \sqrt{3}}}{2}$ or $\dfrac{1}{4}(\sqrt{6} - \sqrt{2})$

[53] 48.59°, 131.41°

[54] 12 meters

[55] D

[56] 1.44

[57] $c = 14.21$ or 1.34

[58] $\alpha = 33.56°$, $\beta = 95.74°$, $\gamma = 50.7°$

[59] 1.93 ft^2

[60] 27.93 m^2

1) Answer: D
2) Answer: C
3) Answer: B
4) Answer: D
5) Answer: C

$\tan B = \dfrac{15}{8}$

$\cos A = \dfrac{12}{13}$

$\cos(A-B) = \dfrac{171}{221}$

$\sin 2A = \dfrac{120}{169}$