

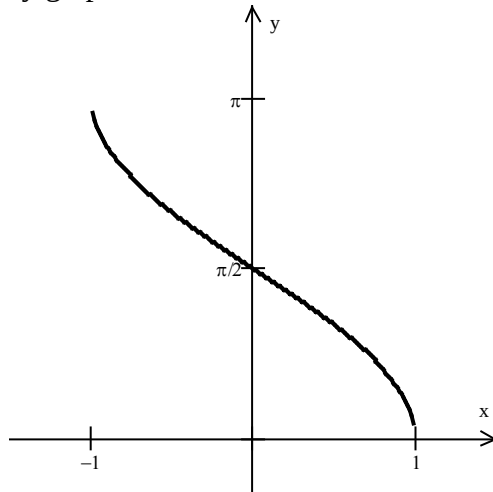
PART I

1. What is the solution of the inequality $|x+1| > 2$?
 a) $-3 < x < 1$ b) $-1 < x < 3$ c) $x > 1$ or $x < -3$ d) $x > 1$ e) $x > 3$ or $x < -1$
2. Find y such that the distance from (3,y) to (-1,2) is $\sqrt{65}$ units.
 a) $\pm 3\sqrt{5}$ b) 5, -9 c) 9, -5 d) 15, -3 e) $2 \pm \sqrt{61}$
3. If $3x^2 - tx + 4$ is exactly divisible by $x - 1$ then t is equal to
 a) 1 b) -7 c) -1 d) 0 e) 7
4. If $2x^3 - 9x^2 + x - 14$ is divided by $x + 1$ the remainder is equal to
 a) -20 b) -26 c) 0 d) -22 e) -8
5. What is the domain of the function $f(x) = |x - 2|$?
 a) $(0, \infty)$ b) $[0, \infty)$ c) $(-\infty, \infty)$ d) $x > 2$ e) All positive integers
6. What is the range of the function $f(x) = -|x - 2|$?
 a) $y = 0$ b) $y \geq 0$ c) $y \leq 0$ d) $y > 2$ e) $y < 2$
7. Find the domain of the function $f(x) = 2^{x+3}$
 a) all reals b) $x > 0$ c) $x > -3$ d) $x > 3$ e) $x < -3$
8. Find the domain of the function $f(x) = \ln(x-2)$
 a) all reals b) $x \geq 0$ c) $x \geq 2$ d) $x > 2$ e) $x > 0$
9. If $f(x) = 3x + 2$ and $g(x) = x^2 - 2$ then $(f \circ g)(x)$ is equal to
 a) $3x^2$ b) $3x^2 - 4$ c) $(3x + 2)^2 - 2$ d) $3x^3 + 2x^2 - 6x - 4$ e) $3x^2 + 2$
10. The inverse of the function $f(x) = 2x + 4$ is
 a) $f^{-1}(x) = 2x + 4$ b) $f^{-1}(x) = \frac{1}{2x+4}$ c) $f^{-1}(x) = \frac{1}{2}x + 2$ d) $f^{-1}(x) = \frac{1}{2}x - 2$
11. What is the vertex of the parabola whose equation is $y = 2x^2 + 12x + 11$?
 a) (3,-7) b) (-3,-7) c) (-3,7) d) (3,7)

12. What is the center and radius of the circle whose equation is $x^2 + y^2 - 2x + 6y + 1 = 0$
- a) C (1,-3); r = 9 b) C (-1,3); r = 3 c) C (1,3); r = 9 d) C (-1,3); r = 1 e) C (1,-3); r = 3
13. Find the domain of the function $y = \frac{x^2 - 16}{x - 4}$.
- a) all real numbers except 4 b) all real numbers except 4 and -4
c) all real numbers except 0 d) all real numbers
14. The vertical asymptote(s) of the graph of $y = \frac{x^2}{x^2 - 4}$ is/are
- a) $x = 2$ and $x = -2$ b) $y = 2$ and $y = -2$ c) $x = 0$ d) $y = 1$
15. Find the roots of the equation $x^3 - 7x + 6 = 0$.
- a) -1,-3,-2 b) -7,6,1 c) -1,3,2 d) 1,-3,2
16. The expression $\log_9 52$ is equal to
- a) 3.95 b) 1.65 c) 0.492 d) 0.871 e) 1.798
17. If $4^{x+2} = 16^{x-2}$, what does x equal?
- a) -6 b) -2 c) 0 d) 8 e) 6
18. If $\log_b 6 = .4040$ then $b^{-.4040}$ is equal to
- a) 6 b) -6 c) $\sqrt{6}$ d) $-\frac{1}{6}$ e) $\frac{1}{6}$
19. The expression $\ln\left(\frac{2x^3}{\sqrt{y}}\right)$ is equivalent to
- a) $\ln 2 + 3\ln x - 2\ln y$ b) $3\ln 2x - \ln \frac{1}{2}y$ c) $\frac{\ln 2 + 3\ln x}{\frac{1}{2}\ln y}$
d) $\ln 2 + 3\ln x - \frac{1}{2}\ln y$ e) $\frac{\ln 2x^3}{\ln y^{\frac{1}{2}}}$
20. If $\log 2 = .3010$ and $\log 3 = .4771$ what is the value of $\log \frac{3}{2}$?
- a) .7781 b) -.7781 c) -.1761 d) .1761

21. If $\log 2 = .3010$ then $\log \sqrt{20}$ is equal to
- a) .6505 b) $\sqrt{1.3010}$ c) .1505 d) $\sqrt{.3010}$ e) $\frac{1}{2}$
22. If $\log_{27} 9 = x$ then x equals
- a) $\frac{2}{3}$ b) -3 c) 0 d) $-\frac{1}{3}$ e) $-\frac{3}{2}$
23. If $\ln x = 3$ then x equals
- a) e^3 b) 3 c) $3e$ d) 1
24. The point (x,y) on the unit circle that corresponds to the real number $t = \frac{5\pi}{6}$ is
- a) $\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$ b) $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$ c) $\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$ d) $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
25. What is the period of the function $y = 4\pi \cos(2x - 3)$?
- a) 2π b) 2 c) π d) 4π e) $\frac{3}{2}$
26. What is the amplitude of the function $y = 4\pi \cos(2x - 3)$?
- a) 4 b) π c) 4π d) 2 e) $\frac{3}{2}$
27. The expression $\cos \frac{5\pi}{6} \cos \pi + \sin \pi \sin \frac{5\pi}{6}$ is equal to
- a) $\frac{1}{2}$ b) $-\frac{\sqrt{3}}{2}$ c) $\frac{\sqrt{3}}{2}$ d) $-\frac{1}{2}$
28. What is the value of $\tan\left(\arccos \frac{\sqrt{2}}{2}\right)$?
- a. 45° b) 1 c) $\frac{\sqrt{2}}{2}$ d) 60° e) 135° and 45°
29. What is the value of $\arccos\left(-\frac{\sqrt{3}}{2}\right)$?
- a. $-\frac{\pi}{6}$ b) $-\frac{\sqrt{3}}{2}$ c) $\frac{\pi}{6}$ d) $\frac{5\pi}{6}$ e) $\frac{\sqrt{3}}{2}$

30. Given: $f(x) = \begin{cases} 3x + 4, & x \leq -3 \\ -x^2 + 1, & x > -3 \end{cases}$ find $f(-2)$
- a) -2 b) 5 c) 10 d) -3 e) 3
31. What values of x in the interval $0 \leq x \leq 2\pi$ satisfies the equation $-3 \cos x + \sin 2x = 0$?
- a) $0, \frac{\pi}{3}, \frac{2\pi}{3}, \pi, 2\pi$ b) $\frac{\pi}{3}, \frac{\pi}{2}, \frac{2\pi}{3}, \frac{3\pi}{2}$ c) $0, \frac{\pi}{6}, \frac{5\pi}{6}, \pi, 2\pi$ d) $\frac{\pi}{6}, \frac{\pi}{2}, \frac{5\pi}{6}, \frac{3\pi}{2}$ e) $\frac{\pi}{2}, \frac{3\pi}{2}$
32. What is 15° , expressed in radian measure?
- a) $\frac{2700}{\pi}$ b) $\frac{1}{12}$ c) 15 d) 15π e) $\frac{\pi}{12}$
33. The expression $\sin 50^\circ$ is equivalent to
- a) $\sin 140^\circ$ b) $\sin 230^\circ$ c) $\cos 310^\circ$ d) $\sin (-50^\circ)$ e) $\cos (40^\circ)$
34. If a circle has a central angle of 150° and a radius of 12 cm, what is the subtended arc length?
- a) 240 cm b) 180 cm c) 31.4 cm d) 5.24 cm e) 1800 cm
35. What is a vertical asymptote to the graph of $y = \tan 4x$?
- a) $x = \frac{\pi}{4}$ b) $x = \frac{\pi}{2}$ c) $x = -\frac{\pi}{4}$ d) $x = \frac{\pi}{3}$ e) $x = -\frac{\pi}{8}$
36. The expression $-1 + \sqrt{3}i$ in trigonometric form is equivalent to
- a) $4\left(\cos \frac{\pi}{3} + i \sin \frac{\pi}{3}\right)$ b) $2\left(\cos \frac{2\pi}{3} + i \sin \frac{2\pi}{3}\right)$ c) $\sqrt{10}\left(\cos \frac{2\pi}{3} + i \sin \frac{2\pi}{3}\right)$ d) $4\left(\cos \frac{5\pi}{6} + i \sin \frac{5\pi}{6}\right)$
37. Which equation is represented by graph below?



- a) $y = \arccos x$ b) $y = \arcsin x$ c) $y = \arctan x$ d) $y = \operatorname{arcsec} x$ e) $y = \tan x$

38. If x is in Quadrant II and $\cos x = -\frac{5}{13}$, what is $\sin 2x$?
- a) $\frac{120}{169}$ b) $\frac{120}{13}$ c) $-\frac{120}{169}$ d) $-\frac{120}{13}$ e) $\frac{19}{169}$
39. Which of the following is a vertical asymptote for $y = \csc x$.
- a) $x = -\frac{\pi}{2}$ b) $x = \frac{\pi}{4}$ c) $x = 1$ d) $x = -\frac{\pi}{4}$ e) $x = \pi$
40. What is the y -intercept of the line whose equation is $2x - 3y - 9 = 0$?
- a) (0,-3) b) (-3,0) c) (0,3) d) (3,0) e) (0,-9)
41. What is an equation of the line passing through the point (3,-1) and parallel to the line whose equation is $y = -3x + 4$?
- a) $3x + y + 10 = 0$ b) $x + 3y = 0$ c) $x - 3y - 6 = 0$
- d) $3x + y - 8 = 0$ e) $4x - y - 13 = 0$
42. The equation of a line passing through the points (3,-2) and (-7,5) is
- a) $7x - 10y + 1 = 0$ b) $7x + 10y - 16 = 0$ c) $7x - 10y - 34 = 0$
- d) $7x + 10y - 41 = 0$ e) $7x + 10y - 1 = 0$

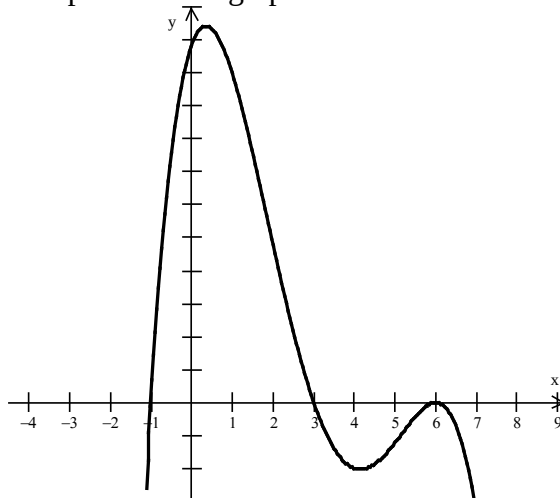
PART II

43. Find the x -intercept(s) of the graph of $f(x) = \frac{4-3x}{2x+5}$
44. Solve for x : $|x-2| < 3$
45. Verify the identity $(\tan^2 x + 1)(\cos^2 x - 1) = -\tan^2 x$
46. Factor $x^4 - 81$ into linear factors.
47. Given $f(x) = \lfloor x \rfloor$ find a) $f(2.8)$ and b) $f(-3.7)$.
48. Write the linear function f for which $f(5) = -4$ and $f(-2) = 17$.
49. If $9x^3 + 2x^2 - x - 8$ is divided by $x - 1$, find the remainder.
50. Find the zeros of the polynomial $P(x) = 2x^3 - 4x^2 + x + 1$.

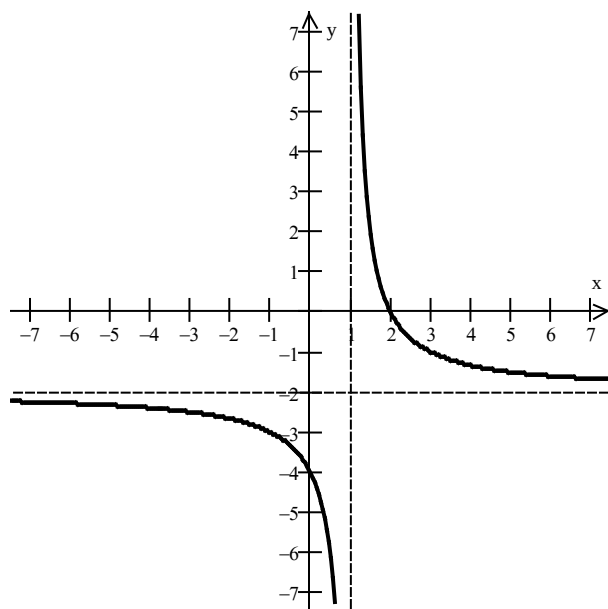
51. Write an equation such that $2i$, $-2i$ and -1 are zeros of a polynomial.
52. Find the domain of the function $y = \sqrt{9 - x^2}$
53. Find the vertical asymptotes for the graph $y = \frac{2x^2}{x^2 - 4}$
54. Find horizontal asymptote for the graph $y = \frac{5 - 3x}{2x + 7}$
55. Given $h(x) = \frac{1}{(x + 3)^2}$, find f and g such that $f[g(x)] = h(x)$.
56. Restrict the domain of $f(x) = (x - 5)^2$ so that it is one-to-one and has an inverse.
57. Find the inverse function of $f(x) = \sqrt{2x - 3}$ and state the domain of f^{-1} .
58. Solve for x : $8^{x-2} = 4^{x+2}$
59. If $\log_b 7 = .4821$ then $b^{-.4821}$ is equal to what value?
60. Condense to a single term: $\log_5(x + 1) + \log_5 x - 2\log_5 y$
61. If $\log_{10} 5 = .6990$ then find $\log_{10} \sqrt{50}$
62. Solve for x : $\log_{81} 3 = x$
63. Solve for x : $\ln(x - 1) = 1$
64. Solve for x : $\log_2(x + 1) - \log_2 x = 1$
65. Find the point (x, y) on the unit circle that corresponds to the real number $t = \frac{23\pi}{6}$.
66. Evaluate: $\sin \frac{5\pi}{6} \cos \frac{\pi}{2} - \cos \frac{5\pi}{6} \sin \frac{\pi}{2}$
67. Find the exact value of $\tan\left(\arccos \frac{\sqrt{3}}{2}\right)$.
68. Find $\arcsin\left(-\frac{\sqrt{3}}{2}\right)$
69. Find $\arccos\left(-\frac{1}{2}\right)$
70. Convert 27° to radian measure.

71. Convert 2 radians into degrees.
72. Find the product $(-1 + \sqrt{3}i)(2\sqrt{3} + 2i)$ in trigonometric form.
73. If $\tan x$ is positive and $\cos x = \frac{3}{5}$, find the value of $\sin x$.
74. The point $(3, 4)$ lies on a circle whose center is at $(-1, 2)$. Write the equation of this circle in standard form.
75. Write the equation of the parabola in standard form whose vertex is $(1, 2)$ and passes through the point $(3, -6)$.
76. Solve the following equation for all values of x in the interval $0 \leq x \leq 2\pi$: $2 \sin x + \sin 2x = 0$
77. If x is in Quadrant II and $\sin x = \frac{12}{13}$ find the values of: a) $\sin 2x$ b) $\cos 2x$ c) $\tan 2x$
78. SKETCH one cycle of the graph of $y = 2 \sin\left(\frac{\pi x}{2} - \pi\right)$
79. If angles x and y are in Quadrant II, $\cos x = -\frac{3}{5}$, and $\tan y = -\frac{15}{8}$ find the value of $\cos(x + y)$.
80. SKETCH one cycle of the graph of $y = \cos\left(x - \frac{\pi}{2}\right)$.
81. Solve and graph on a number line: $\left|\frac{2x-4}{3}\right| \geq 2$
82. SKETCH the graph of the polynomial function $P(x) = (x-3)^2(x+2)(x-7)$
83. SKETCH the graph of the rational function $g(x) = \frac{x+2}{x^2-6x+5}$
84. SKETCH the graph of $g(x) = 2^{x-1}$
85. SKETCH the graph of $f(x) = \log_2 x$
86. SKETCH the graph of $y = |x-3| + 2$
87. SKETCH one cycle of the graph of $y = 4 \sin\left(3\theta + \frac{\pi}{2}\right)$

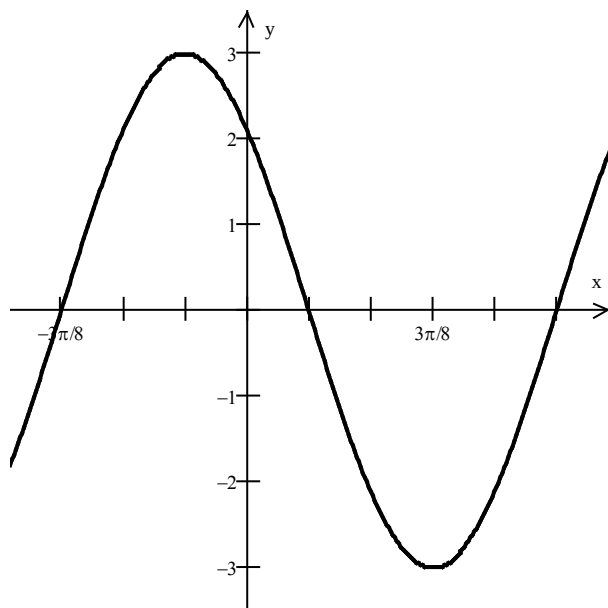
88. a) Write an equation of a function f that represents the graph below.
 b) Find f such that $f(2) = 16$.



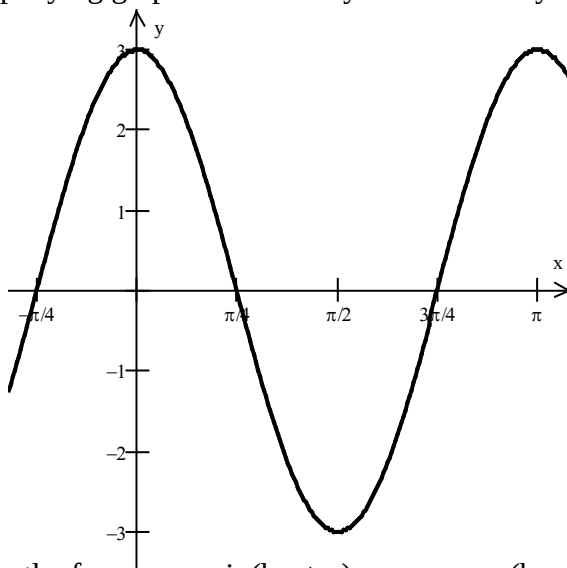
89. Write an equation that represents the accompanying graph.



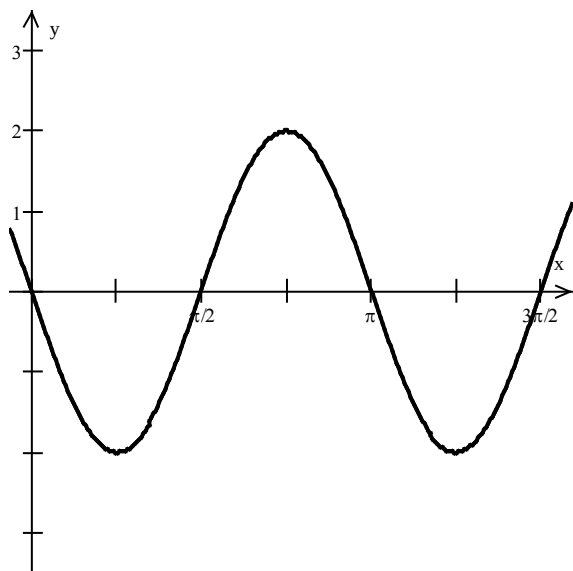
90. Identify the amplitude, period and phase shift for the graph of the sine function below.



91. Write an equation that represents the accompanying graph in the form $y = a \sin bx$ or $y = a \cos bx$.



92. Find an equation that represents this graph in the form $y = a \sin(bx + c)$ or $y = a \cos(bx + c)$.



93. Describe the type of symmetry displayed by each of the following (x-axis, y-axis or origin):

a) $xy^2 + 10 = 0$

b) $y = \sqrt{9 - x^2}$

c) $xy = 4$

d) $y = x^4 - x^2 + 3$

94. Determine the vertical, horizontal, or slant asymptotes of each function:

a) $f(x) = \frac{2+x}{2-x}$

b) $f(x) = \frac{1-5x}{1+2x}$

c) $f(x) = \frac{4}{(x-2)^2}$

d) $\frac{2x^2}{x+1}$

95. Determine whether the following functions are even, odd, or neither:

a) $f(x) = 2x$

b) $f(x) = 3x^4 - 6x^2$

c) $f(x) = x^2 - 2x$

d) $f(x) = x^3 - 5$

96. Plutonium 239 has a half-life of approximately 24,400 years. How long will it take 100 pounds of plutonium 239 to decay to 1 pound?

97. If you deposit \$2,000 in a savings account that earns 5.5% interest compounded continuously, how long will it take to double your money?

ANSWER SHEET

PART I

1. c 2. c 3. e 4. b 5. c 6. c 7. a 8. d 9. b 10. d 11. b 12. e 13. a 14. a 15. d
16. e 17. e 18. e 19. d 20. d 21. a 22. a 23. a 24. c 25. c 26. c 27. c 28. b 29. d 30. d
31. e 32. e 33. e 34. c 35. e 36. b 37. a 38. c 39. e 40. a 41. d 42. e

PART II

43. $x = \frac{4}{3}$ 44. $-1 < x < 5$ 45. proof 46. $(x-3)(x+3)(x-3i)(x+3i)$ 47. a) 2 b) -4 48. $f(x) = -3x + 11$

49. 2 50. $1, \frac{1}{2} \pm \frac{1}{2}\sqrt{3}$ 51. $x^3 + x^2 + 4x + 4 = 0$ 52. $-3 \leq x \leq 3$ 53. $x = 2, x = -2$

54. $y = \frac{-3}{2}$ 55. $g(x) = x + 3$ $f(x) = \frac{1}{x^2}$ 56. $x \geq 5$ or $x \leq 5$ 57. $f^{-1}(x) = \frac{x^2 + 3}{2}$ $x \geq 0$ 58. 10

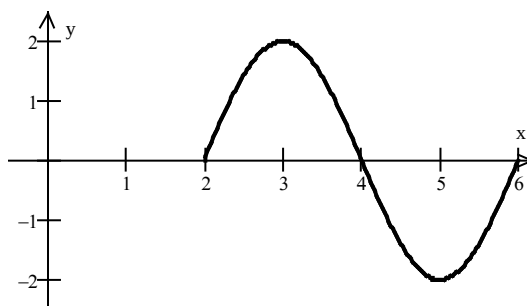
59. $\frac{1}{7}$ 60. $\log_5 \frac{x^2 + x}{y^2}$ 61. .8495 62. $\frac{1}{4}$ 63. $e + 1$ 64. 1 65. $\left(\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$

66. $\frac{\sqrt{3}}{2}$ 67. $\frac{\sqrt{3}}{3}$ 68. $-\frac{\pi}{3}$ 69. $\frac{2\pi}{3}$ 70. $\frac{3\pi}{20}$ 71. 114.592° or $\left(\frac{360^\circ}{\pi}\right)$

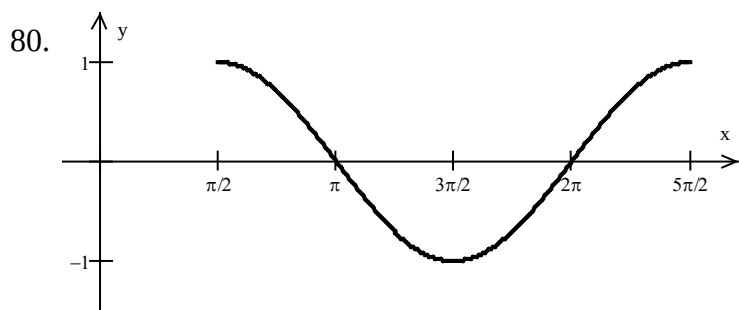
72. $8\left(\cos \frac{5\pi}{6} + i \sin \frac{5\pi}{6}\right)$ 73. $\frac{4}{5}$ 74. $(x+1)^2 + (y-2)^2 = 20$ 75. $f(x) = -2(x-1)^2 + 2$ 76. $0, \pi, 2\pi$

77. a) $-\frac{120}{169}$ b) $-\frac{119}{169}$ c) $\frac{120}{119}$

78.



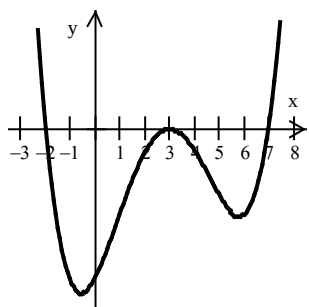
79. $-\frac{36}{85}$



81. $x \geq 5$ or $x \leq -1$

82. 4th degree(+)

Zeros $\{-2, 3, 3, 7\}$



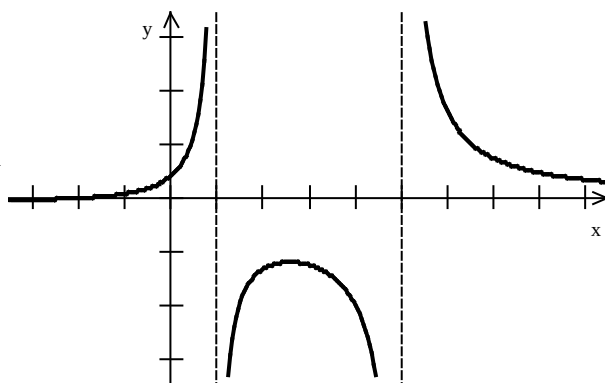
83. $g(x) = \frac{x+2}{(x-5)(x-1)}$

V.A.: $x = 5, x = 1$

H.A.: $y = 0$

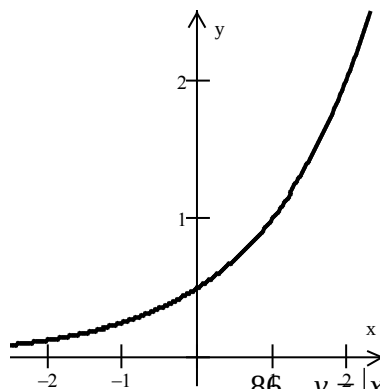
x-int: $(-2, 0)$

y-int: $(0, 2/5)$



84. $g(x) = 2^{x-1}$

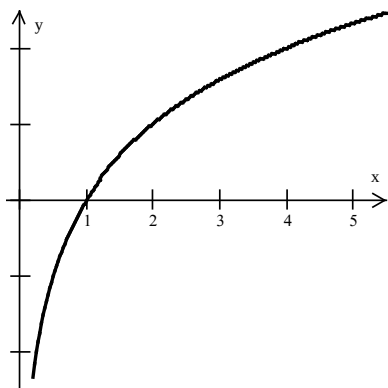
Horiz shift 1 unit right



85. $f(x) = \log_2 x$

V.A.: $x = 0$

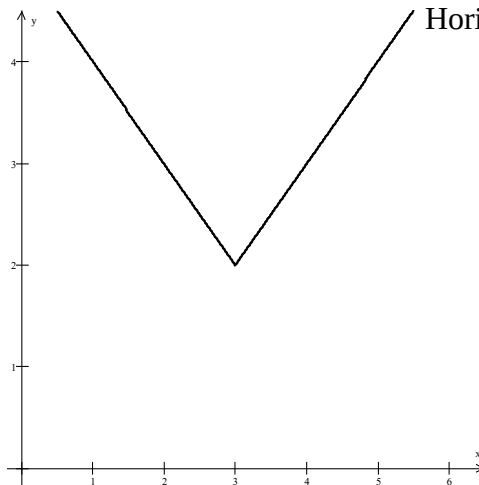
D: $x > 0$



86. $y = |x-3| + 2$

Vertical shift up 2

Horiz shift right 3



87. $y = 4 \sin\left(3\theta + \frac{\pi}{2}\right)$

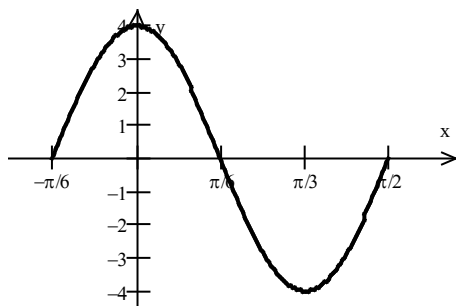
$a = 4$

$b = 3$

period $\frac{2\pi}{3}$

start at $-\frac{\pi}{6}$

end at $\frac{\pi}{2}$



88. a) $f(x) = -1(x+1)(x-3)(x-6)^2$ or $f(x) = (x+1)(3-x)(x-6)^2$

b) $f(x) = -\frac{1}{3}(x+1)(x-3)(x-6)^2$

90. Amplitude is 3

Period is π

Phase shift left $\frac{3\pi}{8}$

$\therefore y = 3 \sin 2\left(x + \frac{3\pi}{8}\right)$ or $y = 3 \sin\left(2x + \frac{3\pi}{4}\right)$

89. $y = \frac{-2(x-2)}{x-1} = \frac{-2x+4}{x-1}$

91. $y = 3 \cos 2x$

92. $y = 2 \sin(2x - \pi)$

93. a) x-axis

b) y-axis

c) origin

d) y-axis

94. a) VA: $x = 2$

b) VA: $x = -1/2$

c) VA: $x = 2$

d) VA: $x = -1$

HA: $y = -1$

HA: $y = -\frac{5}{2}$

HA: $y = 0$

SA: $y = 2x - 2$

95. a) odd

b) even

c) neither

d) neither

96. 162,110 years

97. 12.6 years