Review for Placement Test To Bypass
Math 1301 – College Algebra

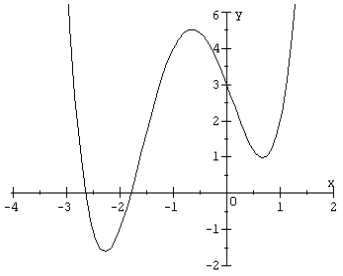
Department of Computer and Mathematical Sciences
University of Houston-Downtown
Revised: Fall 2009

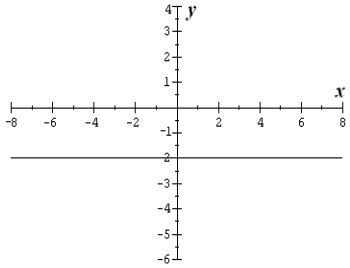
PLEASE READ THE FOLLOWING CAREFULLY:
1. The bypass test cannot be used by a UHD or transfer student to place out of a course in which the student received a grade of D, F, W, or I.
2. The results of the bypass test are valid only for the current semester.
3. You cannot use a calculator on the bypass test.
4. This review is longer than the bypass test.
5. Answers are at the end of the review.

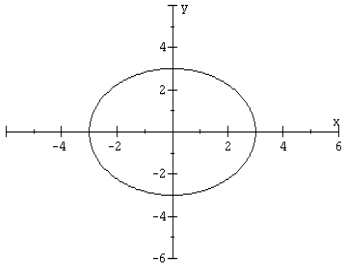
1. Classify each number. Choose all correct answers.
   a. $\sqrt{9}$: (i) natural number (ii) integer (iii) rational number (iv) real number
   b. $\sqrt{2}$: (i) natural number (ii) integer (iii) rational number (iv) real number
   c. $\frac{22}{7}$: (i) natural number (ii) integer (iii) rational number (iv) real number
   d. -10 : (i) natural number (ii) integer (iii) rational number (iv) real number

2. For each measured quantity, choose the set of numbers that is most appropriate to describe it. (There is one correct answer for each part.)
   a. Population of a town: (i) natural number (ii) integer (iii) rational number (iv) real number
   b. Gallons of gasoline purchased at last fill-up:
      (i) natural number (ii) integer (iii) rational number (iv) real number

3. Which of the following graphs are functions?

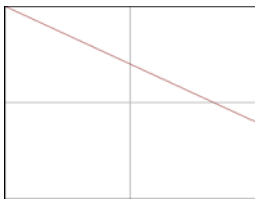
i. 

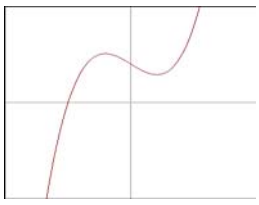
ii. 

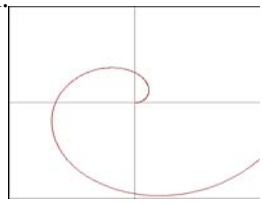
iii. 

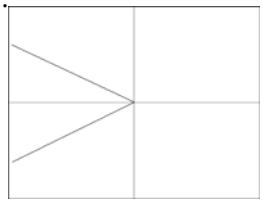
A. i) only
B. iii) only
C. i) and iii)
D. i) and ii)
E. none of these

4. Which of the following graphs are <u>not</u> functions?

i. 

ii. 

iii. 

iv. 

5. Which of the following relations are functions?

i.

x	0	1	2	3
y	0	-1	-2	-3

ii.

x	0	0	2	3
y	2	5	7	11

iii.

x	0	1	2	3
y	2	2	2	2

iv.

x	0	1	2	2
y	10	8	7	7

6. What is the domain of the function $f(x) = \dfrac{2x-4}{3x+1}$?

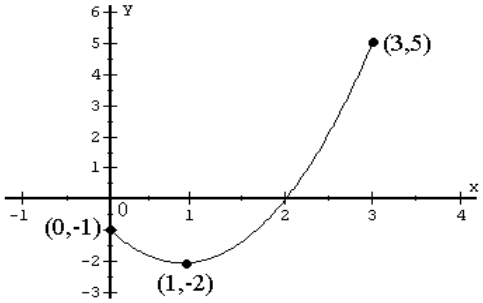
7. What is the domain of the function $y = \sqrt{x-6}$?

A. $x \geq 6$ B. $x < 6$ C. $x \leq 0$ D. $x \leq 6$ E. $x > 0$

8. What is the domain of the function $f(x) = \dfrac{1}{(x-6)(x-2)}$?

9. What is the domain of the function $f(x) = x^2 - 2x - 3$?

10. Find the domain and range of the function f graphed here.

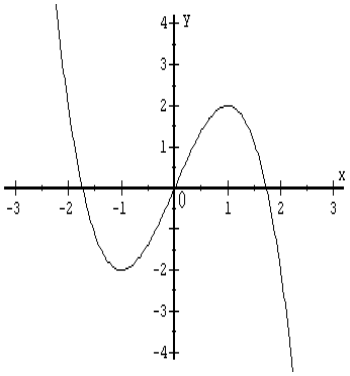


A. domain $= [0, 3]$, range $= [-1, 5]$
B. domain $= [0, 3]$, range $= [-2, 5]$
C. domain $= [-2, 5]$, range $= [0, 3]$
D. domain $= [-1, 4]$, range $= [-3, 6]$
E. domain $= (-\infty, \infty)$, range $= (-\infty, \infty)$

11. For the function f graphed in Problem 10, determine: i. $f(0)$ ii. $f(1)$ iii. $f(2)$ iv. $f(3)$

12. For the function h graphed here, determine:

i. $h(-1)$
ii. $h(0)$
iii. $h(1)$



13. Given that $f(x) = 3x + 5$, find $f(a-1)$.

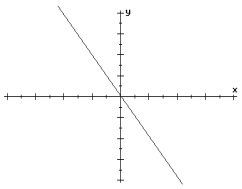
A. $3a + 4$ B. $3a + 5$ C. $3a + 2$ D. $3a + 8$ E. $3a - 3$

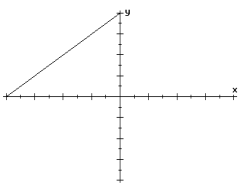
14. Fill in the blanks: If $q(-2.5) = 3.2$, then the point (_____, _____) lies on the graph of q.

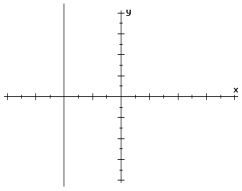
15. For a person x inches tall with a sprained ankle, the length of crutches, in inches, that he or she may need is approximated by $f(x) = 0.92x + 2$. Evaluate and interpret $f(75)$.

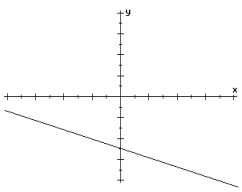
A. A person 75 inches tall needs crutches that are approximately 71 inches long.
B. A person 71 inches tall needs crutches that are approximately 75 inches long.
C. A person 75 inches tall needs crutches that are approximately 146 inches long.
D. A person 75 inches tall needs crutches that are approximately 75 inches long.
E. none of these

16. Which of the following lines have negative slope?

i. 

ii. 

iii. 

iv. 

17. Find the slope and the y-intercept of the line: $2x - 3y - 3 = 0$

18. Which of the following is <u>not</u> true about the graph of the line $4x - 5y = 20$?

A. It rises from left to right.
B. It has y-intercept $= -4$.
C. It passes through the point $(10, 4)$.
D. It has slope $\frac{5}{4}$.
E. It has x-intercept $= 5$.

19. The slope of the line $3x + 5y + 1 = 0$ is:

A. $-\frac{3}{5}$ B. $-\frac{5}{3}$ C. $-\frac{1}{3}$ D. $-\frac{1}{5}$ E. 3

20. The slope of the line passing through the points $(-3, 1)$ and $(2, 3)$ is:

A. $\frac{5}{2}$ B. $-\frac{1}{4}$ C. $\frac{2}{5}$ D. $-\frac{2}{5}$ E. undefined

21. The slope of a line which is perpendicular to the line $y = -2x + 6$ is:

A. $-\frac{1}{2}$ B. $\frac{1}{2}$ C. -2 D. 2 E. $-\frac{1}{6}$

22. The equation of the line passing through the points $(1, -1)$ and $(-1, 3)$ is:

A. $y = 2x - 3$ B. $y = -\frac{1}{2}x - \frac{1}{2}$ C. $y = -2x - 1$
D. $y = -2x + 1$ E. $y = -x$

23. Find the equation of the line with x-intercept $= -2$ and y-intercept $= 3$.

24. Which of the following is the equation of the line passing through the point $(-1, 3)$ and perpendicular to the line $3x + 2y = -2$?
A. $2y - 3x = 11$ B. $3x + 2y = 3$ C. $2x - 3y = -11$
D. $2x + 3y = -7$ E. $2x + 3y = 7$

25. Which of the following is true for the lines with equations $x + 2y = 5$ and $y = -\frac{1}{2}x + 1$?

A. The lines are parallel.
B. The lines are perpendicular.
C. The lines are neither parallel nor perpendicular.
D. The lines are the same.
E. The lines are horizontal.

26. The equation of the line with slope 5 passing through the point $(-2, -3)$ is:

A. $5x - y = 7$
B. $5x - y = -7$
C. $5x - y = -13$
D. $5x + y = -13$
E. $x + 5y = -17$

27. The correct dosage of a particular drug is 50 mg plus 2 mg for each pound the patient weighs. Let y be the correct dosage for a patient weighing x pounds. Write a formula for this function.

A. $x = 50y + 2$
B. $50x + 2y = 0$
C. $y = 50x + 2$
D. $y = 2x + 50$
E. $50y = 2x$

28. A particular car that costs $\$22,000$ new is projected to lose $\$300$ in resale value each month. Let V be the resale value after t months. Write a formula for this function.

29. The typical weight y, in pounds, for a healthy baby elephant that is x months old is given by

$$y = f(x) = 60x + 250$$

i. Interpret the practical meaning of the expression $f(2)$. Do not evaluate.
ii. Find the y-intercept of this line and interpret its practical meaning.
iii. Find the slope of this line and interpret its practical meaning.

30. The amount of oil produced in the U.S. has been decreasing since about 1970. Suppose the following linear function relates the amount of oil, y, produced daily in the U.S. (measured in millions of barrels) to the number of years, x, since 1970.

$$y = f(x) = 10 - 0.125x$$

i. Interpret the practical meaning of the expression $f(37)$. Do not evaluate.
ii. Find the x-intercept of this line and interpret its meaning.
iii. Find the slope of this line and interpret its meaning.

31. The cost of coffee is directly proportional to the amount purchased. Two and a half pounds of coffee cost $\$15$. How many pounds of coffee can be bought with $\$12$?

32. The quantity y is inversely proportional to the quantity x, and $y = 15$ when $x = 3$. Find the constant of proportionality k.

A. $k = \frac{1}{3}$
B. $k = 45$
C. $k = 5$
D. $k = \frac{1}{15}$
E. none of these

33. Which of the following intervals is the solution set of $-5x > -3x + 4$?

A. $(-\infty, 8)$
B. $(-8, \infty)$
C. $(-2, \infty)$
D. $(-\infty, 2)$
E. $(-\infty, -2)$

34. Solve the compound inequality, graph the solution set, and write the answer in interval notation.

$$-1 \leq \frac{3 - x}{5} \leq 3$$

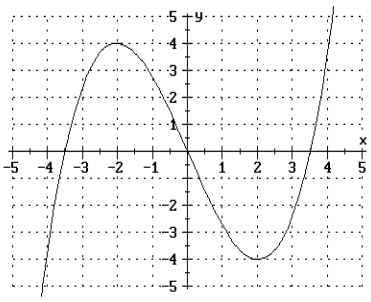
35. Evaluate $f(3)$ given that

$$f(x) = \begin{cases} 3 - x & \text{, if } x \leq -2 \\ x^2 & \text{, if } -2 < x < 1 \\ x + 2 & \text{, if } x \geq 1 \end{cases}$$

A. 0
B. 9
C. 5
D. 1
E. none of these

36. Using the piecewise function defined in Problem 35, evaluate the following:
    i. $f(-2)$ ii. $f(-1)$ iii. $f(1)$

37. For the function f graphed here, find all values for x such that $f(x) = 0$.



38. Solve: $|5x - 7| = 2$

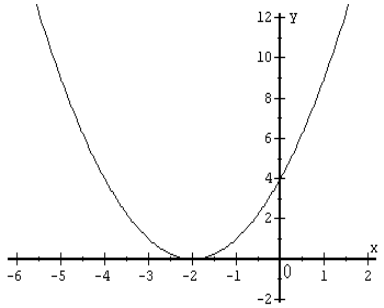
39. Solve the inequality and write the solution in interval notation: $|5x - 7| < 2$

40. The vertex of the parabola with equation $y = x^2 - 2x + 3$ is:
    A. $(-1, 5)$ B. $(0, 3)$ C. $(1, 2)$ D. $(2, 1)$ E. $(3, 6)$

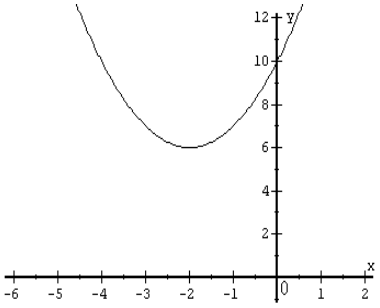
41. The x-intercepts of the parabola with equation $y = x^2 + 8x + 7$ are:
    A. $-8, 7$ B. $-1, 8$ C. $-7, -1$ D. $1, 7$ E. it has none

42. Which of the following graphs represents the function $y = -x^2 + 4x + 2$?

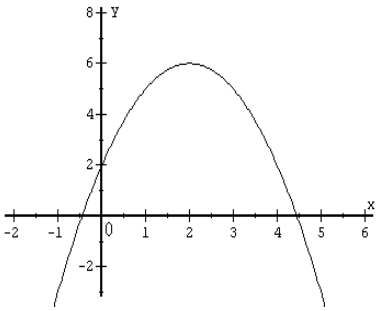
A.



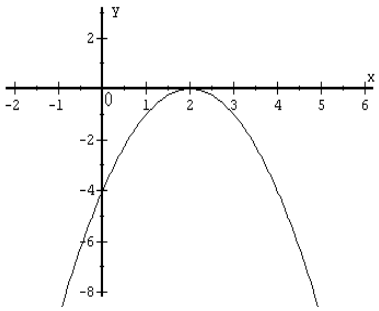
B.



C.



D.



E. none of these

43. Solve the equation: $x^2 + 4x + 1 = 0$

44. Solve the equation: $2x^2 + 5x = 7$

45. Solve the equation: $y(y-3)=10$

46. Solve the equation: $w^2+6w+13=0$

47. Solve the equation: $2x^2+4x=-5$

A. $\dfrac{-4\pm\sqrt{24i}}{4}$ B. $\dfrac{4\pm i\sqrt{24}}{4}$ C. $\dfrac{-4\pm i\sqrt{24}}{4}$

D. $\dfrac{4\pm\sqrt{56}}{4}$ E. $\dfrac{-4\pm i\sqrt{56}}{4}$

48. In an experiment, a ball is thrown upward with an initial velocity of 120 feet per second. Let h be the height (in feet) of the ball above the ground t seconds after it was thrown. Then $h=-16t^2+120t$.
Find the time required for the ball to return to its point of departure.

49. In another experiment, a ball is thrown upward with an initial velocity of 160 feet per second. Let h be the height (in feet) of the ball above the ground t seconds after it was thrown. Then $h=-16t^2+160t$.
Find the maximum height of the ball.

A. 400 B. 80 C. 160 D. 144 E. none of these

50. Solve the inequality and write the solution in interval notation: $x^2-x-12\geq 0$

51. Which <u>one</u> of the following functions is a polynomial? What is its y-intercept? What is its domain?

A. $f(x)=x^3+4x^2+3$ B. $f(x)=\sqrt[3]{x^2}+5$ C. $f(x)=\dfrac{2}{x^3+2}$

D. $f(x)=x^{-2}+3x^{-1}-4$ E. $f(x)=2^x$

52. What is the degree of the polynomial function $f(x)=2x^3+x^2-5x^4$?
What is the leading coefficient?

53. Write each expression in $a+bi$ form.

i. $(3-\sqrt{-36})+(2+\sqrt{-16})$ ii. $(3+4i)(1-2i)$

54. Simplify: $(1+i)^2$

55. Let $f(x)=x^2+x$ and $g(x)=x-1$. Find $(f\circ g)(x)$.

A. x^2-2x+1 B. x^2+x-1 C. x^2+x

D. $(x^2+x)(x-1)$ E. x^2-x

56. Let $f(x)=\sqrt{x}$ and $g(x)=3x+1$. Find $f(g(1))$.

A. 4 B. 1 C. 2 D. $\sqrt{3}+1$ E. $\sqrt{3}$

57. Let $f(x)=3-5x$. Then $f^{-1}(x)=$

A. $\dfrac{3-x}{5}$ B. $5x-3$ C. $\dfrac{1}{3-5x}$ D. $\dfrac{x}{5}+3$ E. $5-3x$

58. Let $f(x)=\sqrt{x+2}$. Then $f^{-1}(x)=$

A. $-\sqrt{x+2}$ B. $\dfrac{1}{\sqrt{x}+2}$ C. $\sqrt{x-2}$ D. x^2-2 E. x^2+2

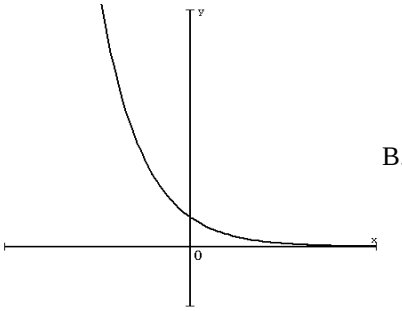
59. The intensity I of light (in lumens) x meters below the water surface is given by the formula $I = I_0 k^x$, where I_0 is the intensity of light on the water surface and k is the clarity constant of the water. At one location in the Atlantic Ocean, $I_0 = 12$ and $k = 1/16$. Find the intensity of light at a depth of $1/2$ meters.

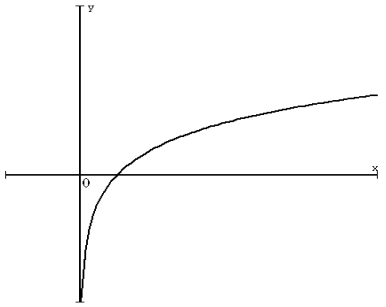
A. $3/8$ lumens B. 6 lumens C. 3 lumens
D. 8 lumens E. $3/2$ lumens

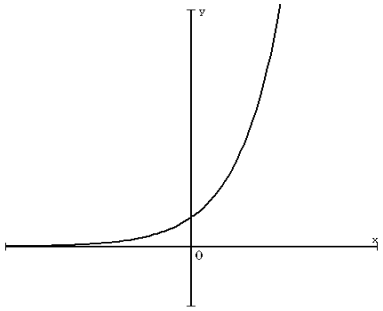
60. For the exponential function $f(x) = 10(16)^x$, evaluate $f(1/4)$.
A. 40 B. 20 C. 160 D. 80 E. none of these

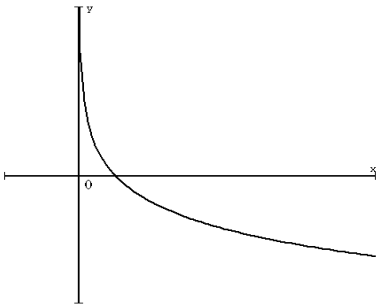
61. For the exponential function $f(x) = 2^x$, evaluate $f(-3)$.

62. Which of the following graphs could represent the function $f(x) = \left(\frac{1}{3}\right)^x$?

A. 

B. 

C. 

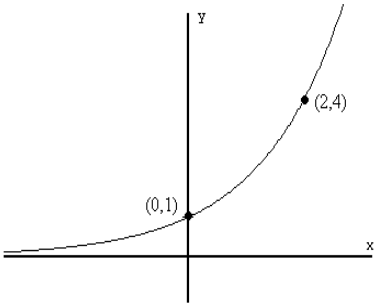
D. 

E. none of these

63. Which of the graphs in Problem 84 could represent the function $f(x) = \log_2 x$?

64. Which of the following functions is graphed here?

A. $y = 2^x$
B. $y = 4^x$
C. $y = 2x$
D. $y = x + 2$
E. none of these



65. Which equation is equivalent to $3^{-2} = \frac{1}{9}$?

A. $\log_3(-2) = \frac{1}{9}$ B. $\log_{\frac{1}{9}} 3 = -2$ C. $\log_3 \frac{1}{9} = -2$
D. $\log_{(-2)} \frac{1}{9} = 3$ E. none of these

66. Express in logarithmic form: i. $25^{1/2} = 5$ ii. $\left(\frac{1}{2}\right)^{-5} = 32$

67. Write the following equations in exponential form: i. $\log_2 3 = x$ ii. $\log_2 x = 3$

68. Evaluate each of the following:

i. $\log_4 64$ ii. $\log_5 25$ iii. $\log \frac{1}{10}$ iv. $\ln 1$

69. Evaluate: $\log_{\frac{1}{2}} 8$

A. 4 B. 16 C. -3 D. 3 E. none of these

70. Find the value of x if $\log_3 x = -2$.

A. $x = \frac{1}{8}$ B. $x = 9$ C. $x = \frac{1}{9}$ D. $x = -6$ E. none of these

71. Find the value of x if $\ln x = -2$.

A. $x = e^2$ B. $x = e^{-2}$ C. $x = 10^{-2}$ D. $x = 10^2$ E. none of these

72. Find the value of x if $\log_x 36 = 2$.

A. $x = 6$ B. $x = 18$ C. $x = \frac{1}{18}$ D. $x = \frac{1}{6}$ E. none of these

73. Rewrite the following as a single logarithmic expression: $8 \ln x - 2 \ln y$

74. Expand the following expression, and write your answer without using exponents or radicals: $\ln a\sqrt[3]{bc}$

75. Solve: $10^x = 50$

A. $x = 5$ B. $x = \log 50$ C. $x = 50 \cdot \log 10$ D. $x = \log \frac{1}{5}$ E. $x = 500$

76. Solve: $e^{x+2} - 10 = 0$

77. Solve the system and find the value of x :

$$\begin{cases} x + y - z = -1 \\ x - 2y + z = 9 \\ 2x + y + 2z = 8 \end{cases}$$

A. $x = -3$ B. $x = 0$ C. $x = 3$ D. $x = 1$ E. none of these

78. Three hundred people attended a high school play. The admission prices were \$5 for adult, \$3 for high school students and \$2 for children not yet in high school. The ticket sales totaled \$950. If the admission prices were \$6 for adults, \$4 for high school students and \$2 for students not yet in high school, the ticket sales total would have been \$1,100. Let x, y and z denote the number of adults, high school students and children, respectively. Find x, y and z. (*Hint*: Set up and solve a system of equations.)

ANSWERS

1a. i,ii,iii,iv | 1b. iv | 1c. iii,iv | 1d. ii,iii,iv

2a. i | 2b. iii

3. D | 4. iii,iv | 5. i,iii,iv

6. All real numbers except $-1/3$ | 7. A | 8. All real numbers except 2 and 6

9. All real numbers | 10. B

11i. -1 | 11ii. -2 | 11iii. 0 | 11iv. 5

12i. -1.75 | 12ii. 0 | 12iii. 1.75 | 13. C

14. $(-2.5, 3.2)$ | 15. A | 16. i,iv | 17. slope $= \frac{2}{3}$, y-intercept $= -1$

18. D | 19. A | 20. C | 21. B

22. D | 23. $y = \frac{3}{2}x + 3$ | 24. C | 25. A

26. B | 27. D | 28. $V = 22\,000 - 300t$

29i. $f(2)$ is the typical weight of a healthy baby elephant that is 2 months old.

29ii. y-intercept $= 250$; A healthy newborn baby elephant typically weighs 250 lb.

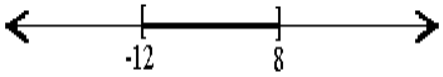
29iii. slope $= 60$; A healthy baby elephant typically gains 60 lb per month.

30i. $f(37)$ is the amount of oil produced daily in the U.S. in 2007.

30ii. x-intercept $= 80$; By 2050, no oil will be produced in the U.S.

30iii. slope $= -0.125$; Since 1970, the amount of oil produced daily in the U.S. has decreased by 0.125 million barrels per year.

31. 2 lb | 32. B | 33. E

34. 

, $[-12, 8]$

35. C | 36i. 5 | 36ii. 1 | 36iii. 3

37. $x = -3.5, 0, 3.5$ | 38. $x = 1, \frac{9}{5}$ | 39. $(1, \frac{9}{5})$ | 40. C

41. C | 42. C | 43. $x = \frac{-4 \pm \sqrt{12}}{2}$

44. $x = -\frac{7}{2}, 1$ | 45. $y = -2, 5$ | 46. $w = -3 \pm 2i$ | 47. C

48. 7.5 sec | 49. A | 50. $(-\infty, -3] \cup [4, \infty)$

51. A; y-intercept $= 3$; domain $=$ all real numbers | 52. degree $= 4$; leading coefficient $= -5$

53i. $5-2i$ 53ii. $11-2i$ 54. $2i$ 55. E

56. C 57. A 58. D 59. C

60. B 61. $1/8$ 62. A

63. B 64. A 65. C 66i. $\log_{25} 5 = \dfrac{1}{2}$

66ii. $\log_{\frac{1}{2}} 32 = -5$ 67i. $2^x = 3$ 67ii. $2^3 = x$ 68i. 3

68ii. 2 68iii. -1 68iv. 0 69. C

70. C 71. B 72. A 73. $\ln x^6$

74. $\ln a + \dfrac{1}{3}\ln b + \dfrac{1}{3}\ln c$ 75. B 76. $x = \ln 10 - 2$ 77. C

78. $x = 100$, $y = 50$, $z = 150$