AFM Final Exam Review Name Key

1. A home security company offers a security system that uses the numbers 0 through 6, inclusive, for a 3-digit security code. How many different security codes are possible if no digit may be repeated?

a) 35 b) 210 c) 20 d) 120 $_7P_3$

2. Using a standard deck of playing cards, find the probability of randomly selecting a queen, replacing it in the deck, and then selecting a heart.

a) $\frac{1}{26}$ b) $\frac{1}{52}$ c) $\frac{1}{17}$ d) $\frac{1}{4}$ $\frac{4}{52} \cdot \frac{13}{52}$

3. Josie has 2 classical, 3 jazz, and 1 folk CD in her car. If she pulls 2 CDs from her CD case without looking, what is the probability that both CDs are jazz?

a) $\frac{1}{5}$ b) $\frac{1}{15}$ c) $\frac{1}{3}$ d) $\frac{1}{4}$ $\frac{3}{6} \cdot \frac{2}{5}$

4. A bag contains 2 yellow, 4 blue, and 3 white marbles. What is the probability that a marble selected at random will not be blue?

a) $\frac{2}{3}$ b) $\frac{2}{9}$ c) $\frac{4}{9}$ d) $\frac{5}{9}$

5. Find the number of distinguishable permutations using the letters from the word ROBMURRO.

a) 13,440 b) 3360 c) 40,320 d) 5040 $\frac{8!}{3!2!}$

6. A committee composed of 4 men and 3 women is to be selected from a group of 20 men and 16 women. How many different committees can be formed?

a) 2,074,800 b) 3840 c) 2,713,200 d) 6840 $_{20}C_4 \cdot {}_{16}C_3$

7. How many ways can 5 digits on a license plate be arranged if the first digit cannot be 0? (digits can repeat)

a) 90,000 b) 100,000 c) 30,240 d) 45360

9 10 10 10 10

8. Two cards are chosen from a deck of 52 cards. What is the probability that the first card is a heart and the second card is a black face card?

$\frac{13}{52} \cdot \frac{6}{51} = \frac{1}{34}$

9. From a standard deck of 52 cards, a card is dealt. What is the probability that a red card or an ace is drawn?

$\frac{26}{52} + \frac{4}{52} - \frac{2}{52} = \frac{7}{13}$

10. Joe gets \$2 if a coin shows up heads and \$1 if it shows up tails. What is his expected value?

a) \$1.00 b) \$1.25 c) \$1.32 d) \$1.50

$2\left(\frac{1}{2}\right) + 1\left(\frac{1}{2}\right)$

11. For the data set {3, -5, 7, 4, 8, 2, 11, -3, -6}, find the 5-number summary.

a) minimum = -6, median = 3, maximum = 11, range = 17, mean = 2.33
b) minimum = -6, maximum = 11, mean = 2.33, median = 3, mode = none
c) minimum = -6, lower quartile = -4, median = 3, upper quartile = 7.5, maximum = 11
d) lower quartile = -4, upper quartile = 7.5, mean = 2.33, minimum = -6, maximum = 11

12. Use the frequency table to find the mean, median, and mode.

Aptitude Score	1	2	3	4	5
Frequency	2	1	3	5	2

a) mean = 3, median = 3, mode = none
b) mean = 3, median = 4, mode = 4
c) mean = 3.3, median = 4, mode = 4
d) mean = 3.3, median = 3, mode = 4

13. Find the range and the interquartile range of the set of values: 37, 21, 44, 19, 22, 47, 26, 32, 25, 43, 11, 15

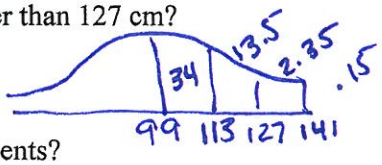
a) range: 37, interquartile range: 16
b) range: 36, interquartile range: 16
c) range: 36, interquartile range: 20
d) range: 36, interquartile range: 24

Min = 11 $Q_1 = 20$
Max = 47 $Q_3 = 40$

14. The lengths of a certain species of fish were found to be normally distributed. The mean length is 99 cm with a standard deviation of 14 cm. In a school of 480 of these fish, about how many would be longer than 127 cm?

a) 65 fish
b) 163 fish
c) 468 fish
d) 12 fish

480 (.025)



15. Which method would produce the least biased sample of a school population of 1000 students?

a) One student from each letter of the alphabet (by last name) are selected.
b) all the members of faculty are selected.
c) all the student body officers are selected.
d) all the members of the archery club are selected.

16. Identify the outlier of the set of values: 55, 57, 40, 47, 39, 38, 72

a) 47
b) 72
c) 38
d) none of the above

17. Write an exponential function to model this situation: a population of 300 animals increases at an annual rate of 13%.

a) $f(x) = 300(0.113)^x$
b) $f(x) = 300(.87)^x$
c) $f(x) = 300(0.087)^x$
d) $f(x) = 300(1.13)^x$

18. Find the domain of the function: $f(x) = \sqrt{x-1}$ $x-1=0$ $x=1$

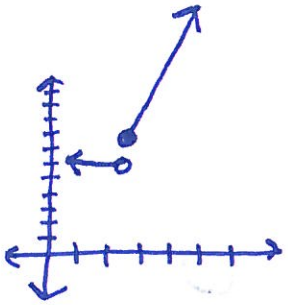
a) $(0,1)\cup(1,\infty]$
b) $(1,\infty)$
c) $[0,1)\cup(1,\infty)$
d) $[1,\infty)$

19. The graph $y = x^3 - 9x - 3$ is increasing between what interval/s?

a) $(-\infty, 7.39]\cup[-13.39,\infty)$
b) $(-\infty,-1.73]\cup[1.73,\infty)$
c) $[-1.73,1.73]$
d) $[-13.39,7.39]$

20. Evaluate the piecewise function at f(0), f(2), and f(3). $f(x) = \begin{cases} 6 \text{ if } x<2 \\ 4x-1 \text{ if } x\geq 2 \end{cases}$

a) f(0) = -1, f(2) = 6, f(3) = 11
b) f(0) = 6, f(2) = 7, f(3) = 11
c) f(0) = 0, f(2) = 6, f(3) = cannot determine
d) f(0) = 6, f(2) = 7, f(3) = 7



21. Graph the previous piecewise function and state the domain and range.

D: $(-\infty,\infty)$ R: $[6]\cup[7,\infty)$

22. A silk-screen shop charges an initial fee of \$10 to create the silk screen and \$8.50 per shirt for the first 25 shirts. If you decide to purchase more than 25 shirts, the price goes down to \$7.75 per shirt (after the first 25 shirts are purchased). Write a function that gives the cost, C, for an order of x shirts. How much does it cost to purchase 20 shirts? 40 shirts?

$$C(x) = \begin{cases} 10 + 8.50x & ; 0 < x \leq 25 \\ 222.50 + 7.75(x-25) & ; x > 25 \end{cases}$$

20 = \$180
40 = \$338.75

23. Change from logarithmic form to exponential form: $\log_{27} 9 = \frac{2}{3}$

a) $9^{\frac{2}{3}} = 27$ b) $\left(\frac{2}{3}\right)^9 = 27$ c) $(9)^{\frac{3}{2}} = 27$ d) $27^{\frac{2}{3}} = 9$

24. Convert from exponential form to logarithmic form: $16^{\frac{1}{2}} = 4$

a) $\log_2 4 = \frac{1}{2}$ b) $\log_{16} \frac{1}{2} = 4$ c) $\log_{16} 4 = \frac{1}{2}$ d) $\log_{16} \frac{1}{2} = 4$

25. Solve $4^{6x} = 496$.

a) 0.6472 b) 0.7462 c) 3.6413 d) 4.477

$6x \log 4 = \log 496$ $6x = \log 496 / \log 4$ $\frac{6x}{6} = \frac{4.4771}{6}$ $x = 0.7462$

26. Evaluate the following: (4 problems here!)

a) $\log_6 216 =$ 3 b) $\ln 1 =$ 0 c) $\log 10 =$ 1 d) $3^{\log_3 5} =$ 5

$6^x = 216$

27. Solve the logarithmic equations, accurate to 4 decimal places. (3 problems here!)

a) $\log_x(-4) = \frac{1}{3}$ $= 64$ b) $\log_4(3x-2) = 3$ c) $e^{4x-1} = 9$ $x = 0.7993$

$-4 = x^{1/3}$ $x = (-4)^3$ $4^3 = 3x - 2 \rightarrow 64 = 3x - 2$ $x = 22$ $4x - 1 = \ln 9$

28. The graph $y = 2\log_3(x-1) + 2$ has an asymptote of _____.

a) y = 2 b) y = 1 c) x = 1 d) x = 2

29. Find the balance of a \$500 investment after 18 years earning 7.9% interest compounded continuously.

a) \$502.20 b) \$541.10 c) \$2146.32 d) \$2072.70 $500e^{.079(18)}$

30. What interest rate is required for an investment with continuously compounded interest to double in 5 years?

a) 3.47% b) 6.93% c) 13.86% d) 3.86 $2 = e^{r(5)}$ $\ln 2 = r \cdot 5$ $r = \ln 2/5$

31. Determine the amount of money in a money market account providing an annual rate of 7% compounded daily if George invested \$2500 and left it in the account for 10 years.

$2500\left(1 + \frac{.07}{365}\right)^{365 \cdot 10}$

a) \$4917.88 b) \$4915.25 c) \$4974.47 d) \$5034.04

32. The half-life of radium-226 is 1590 years.

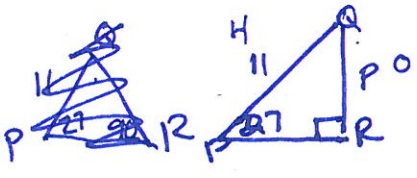
a) If a sample has a mass of 150 mg, find the mass that remains after 1000 years. $150e^{-\ln 2/1590 \cdot 1000} = 96.998$

b) After how many years will only 50 mg remain? $50 = 150e^{-\ln 2/1590 t}$ $t = 2520.09$ yrs

33. The number of bacteria in a culture is modeled by the function, $n(t) = 500e^{0.45t}$. How many bacteria are in the culture after 3 hours? 1928.71

34. If $\angle P = 27°$, $\angle R = 90°$, and $r = 11$, find p.

a) 24.2 b) 5.0 c) 9.8 d) 5.0



$\sin(27) = \frac{x}{11}$

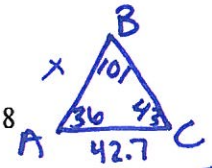
35. The angle of elevation of a ladder leaning against a wall is 55°. The ladder is 30 feet long. How high up the wall does it reach?

a) About 52.30 ft b) about 17.21 ft c) about 24.57 ft d) about 42.8 ft

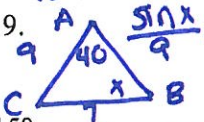
$\sin(55) = \frac{x}{30}$

$\frac{\sin 101}{42.7} = \frac{\sin 43}{x}$

36. In ΔABC, find c if $\angle A = 36°$, $\angle B = 101°$, and $b = 42.7$.
a) about 40.2 b) about 29.7 c) about 25.3 d) about 31.8

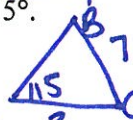


37. Determine the number of possible solutions for ΔABC, given $\angle A = 40°$, $a = 7$, and $b = 9$.
a) two b) one c) three d) none



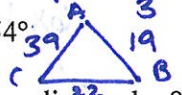
$\frac{\sin x}{9} = \frac{\sin 40}{7}$

38. Determine the number of possible solutions for ΔABC, given $a = 7$, $b = 3$, and $\angle A = 115°$.
a) two b) one c) three d) none



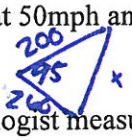
$\frac{\sin x}{3} = \frac{\sin 115}{7}$

39. In ΔABC, given $a = 22$, $b = 39$ and $c = 19$, find B.
a) about 144° b) about 126° c) about 36° d) about 54°



$39^2 = 19^2 + 22^2 - 2(19)(22)\cos B$

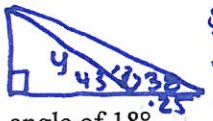
40. Two motorists start at the same point and travel in 2 straight courses. The courses diverge by 95°. If one is traveling at 50mph and the other is traveling at 60mph, how far apart will they be after 4 hours?



$x^2 = 200^2 + 260^2 - 2(200)(260)\cos 95$

$x = 116664.19$ miles

41. A geologist measured a 43° angle of elevation to the top of a volcano crater. After moving 0.25 km farther away, the angle of elevation was 38°. Find the height of the volcano crater.



$\frac{\sin 5}{.25} = \frac{\sin 38}{y}$

$y = 1.77$

$\sin 43 = \frac{x}{1.77}$ $\quad x = 1.21$

42. For a circle of radius 6 feet, find the arc length s cut off by a central angle of 18°.
a) about 3.78 ft b) about 5.65 ft c) about 1.88 ft d) about 108 ft

$S = r\theta$

$\theta = 18 \cdot \frac{\pi}{180} = \frac{\pi}{10}$ $\quad = 6\left(\frac{\pi}{10}\right)$

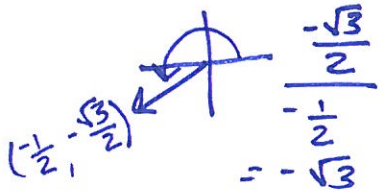
43. Find the measure of the reference angle of -200°.
a) 20° b) 140° c) 60° d) -200°

44. A sector has an area of 14.5 square meters. The radius of the circle is 4 meters. Find the radian measure of the central angle to the nearest tenth.
a) 7.3 radians b) 14.6 radians c) 1.8 radians d) 3.6 radians

$A = \frac{1}{2} r^2 \theta$

$14.5 = \frac{1}{2} 4^2 \theta$

45. Evaluate $\tan \frac{4\pi}{3}$.
a) $-\frac{\sqrt{3}}{3}$ b) $\frac{\sqrt{3}}{3}$ c) $\sqrt{3}$ d) $\sqrt{3}$



46. Find an angle between 0 and 360° that is coterminal to -2100°.
a) 300° b) 30° c) 60° d) -300°

47. Find the terminal point of $t = \frac{-11\pi}{6}$. → π/6 coterminal

a) $\left(\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$ b) $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$ c) $\left(\frac{-\sqrt{3}}{2}, \frac{1}{2}\right)$ d) $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$

48. Given that $\sin t > 0$ and $\cos t < 0$, find the quadrant in which the terminal point determined by t lies.
a) I b) II c) III d) IV

+Y -X

49. Convert to radians: $-105°$ · π/180

a) $\frac{7\pi}{12}$ b) $\frac{-7\pi}{12}$ c) $\frac{7\pi}{6}$ d) $\frac{-12}{7\pi}$

50. State the amplitude and period for the function $y = -3 \sin 3\theta$. 2π/3

a) -3; $\frac{3\pi}{2}$ always + b) -3, $\frac{2\pi}{3}$ c) 3, $\frac{3\pi}{2}$ d) 3, $\frac{2\pi}{3}$

51. Find $7A + 6B$.

$$A = \begin{bmatrix} 1 & -1 \\ 0 & -3 \\ 5 & 2 \end{bmatrix} \quad B = \begin{bmatrix} -2 & 1 \\ 5 & 4 \\ 0 & -7 \end{bmatrix}$$

a. $\begin{bmatrix} 19 & -13 \\ 30 & 3 \\ -35 & 56 \end{bmatrix}$

b. $\begin{bmatrix} -5 & -1 \\ 0 & 3 \\ 0 & -28 \end{bmatrix}$

c. $\begin{bmatrix} -5 & -1 \\ -30 & -45 \\ 35 & 56 \end{bmatrix}$

d. $\begin{bmatrix} -5 & -1 \\ 30 & 3 \\ 35 & -28 \end{bmatrix}$

52. Solve for the missing variables $\begin{bmatrix} -14 & -w^2 \\ 3f & 3 \end{bmatrix} = \begin{bmatrix} 2k & -81 \\ -3 & 3 \end{bmatrix}$

a. $f = -1, k = 7, w = 9$ or -9

b. $f = -1, k = -7, w = 9$

c. $f = -1, k = -7, w = 81$ or -81

d. $f = -1, k = -7, w = 9$ or -9

53. Mel and Ann were having breakfast at a restaurant. Mel paid $3.25 for 4 eggs and 2 sausage patty. Ann paid $3.50 for 2 eggs and 4 sausage patties. Which of the following equations could be solved to determine the cost of each item?

a) $\begin{bmatrix} 4 & 2 \\ 4 & 2 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 3.25 \\ 3.50 \end{bmatrix}$ b) $\begin{bmatrix} 4 & 2 \\ 2 & 4 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 3.25 \\ 3.50 \end{bmatrix}$ c) $\begin{bmatrix} x & y \end{bmatrix}\begin{bmatrix} 4 & 2 \\ 4 & 2 \end{bmatrix} = \begin{bmatrix} 3.25 & 3.50 \end{bmatrix}$

d) $\begin{bmatrix} x & y \end{bmatrix}\begin{bmatrix} 4 & 4 \\ 2 & 2 \end{bmatrix} = \begin{bmatrix} 3.25 & 3.50 \end{bmatrix}$

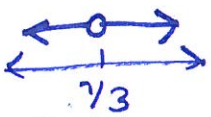
54. Given the matrix equation $\begin{bmatrix} 3 & -1 \\ 2 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 \\ 4 \end{bmatrix}$ what would you multiply both sides by to solve the system using the inverse matrix method?

$A^{-1} = \begin{bmatrix} 1/5 & 1/5 \\ -2/5 & 3/5 \end{bmatrix}$

55. Find the domain of the following function, $f(x) = \frac{4}{3x-7}$.

$3x - 7 = 0$

$x = 7/3$



A) $(-\infty, \frac{7}{3}]$ B) $(-\infty, \frac{7}{3}] \cup [\frac{7}{3}, \infty)$ C) $(-\infty, \frac{7}{3}) \cup (\frac{7}{3}, \infty)$ D) $(\frac{7}{3}, \infty)$

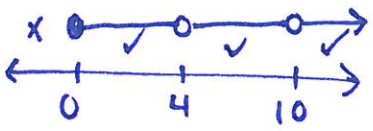
56. Find the domain of the following function:

$$f(x)=\frac{\sqrt{x}}{x^2-14x+40}$$

$x \geq 0$

$x^2-14x+40$

$(x-10)(x-4)$ $x=4$ $x=10$



A) $(-\infty,4)\cup(4,10)\cup(10,\infty)$
B) $(4,10)$
C) $[0,4)\cup(4,10)\cup(10,\infty)$
D) $[0,4)\cup(10,\infty)$

57. Juliet plans to buy a supply of blank compact discs. She checked price lists and found out that if she bought 100 CD's or less that it would cost her \$.70 each. However, if she buys between 100 and 200 CD's, the price drops to \$.65 each for the second hundred. Also, for any purchase of more than 200, the price drops again to \$.61 for each one over 200. What is the cost for Juliet to purchase 260 compact discs?

A) \$152.00
B) \$182.00
C) \$158.60
D) \$171.60

58. Write a piecewise function for the scenario in number 57.

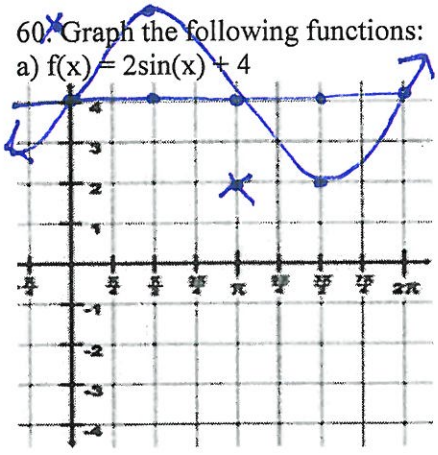
$$f(x)=\begin{cases} .70x\ ;\ 0<x\leq 100 \\ 70+.65(x-100)\ ;\ 100<x\leq 200 \\ 135+.61(x-200)\ ;\ x>200 \end{cases}$$

59. If the function $f(x)=\sqrt{x}$ is reflected over the x-axis, shifted to the left 2 units and shifted up 3 units, what new function, g(x) should be obtained?

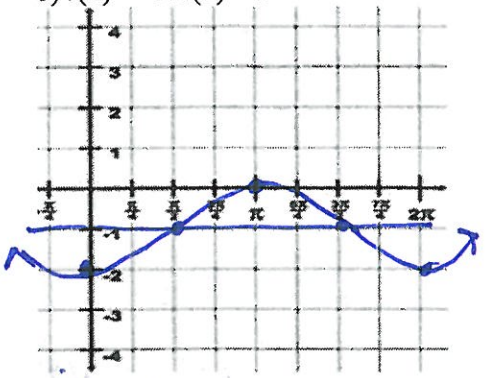
A) $g(x)=3-\sqrt{x+2}$
B) $g(x)=3+\sqrt{-x+2}$
C) $g(x)=3-\sqrt{x-2}$
D) $g(x)=3+\sqrt{x+2}$

60. Graph the following functions:

a) $f(x)=2\sin(x)+4$



b) $f(x)=-\cos(x)-1$



61. Evaluate

$$\begin{vmatrix} 1 & 0 & 2 \\ -1 & 0 & 1 \\ -1 & -2 & 0 \end{vmatrix} = 6$$

62. Solve the following system using Cramer's rule. Do not use a calculator.

$$\begin{aligned} z &= -3x+3y+11 \\ -3x+7y-7z &= 3 \\ -2x+2y-6z &= 30 \end{aligned}$$

$3x-3y+z=11$

$D=\begin{vmatrix} 3 & -3 & 1 \\ -3 & 7 & -7 \\ -2 & 2 & -6 \end{vmatrix}=-64$

$D_x=\begin{vmatrix} 11 & -3 & 1 \\ 3 & 7 & -7 \\ 30 & 2 & -6 \end{vmatrix}=64$ $D_y=\begin{vmatrix} 3 & 11 & 1 \\ -3 & 3 & -7 \\ -2 & 30 & -6 \end{vmatrix}=448$

$D_z=\begin{vmatrix} 3 & -3 & 11 \\ -3 & 7 & 3 \\ -2 & 2 & 30 \end{vmatrix}=448$

$x=\frac{64}{-64}=-1$ $y=\frac{448}{-64}=-7$ $z=\frac{448}{-64}=-7$

x y z

$(-1,-7,-7)$

63. The first number multiplied by 2 is the opposite of the second number. The third number is subtracted from the product of the second number and 3 to get 20. The sum of the first and third numbers is -5. Use a matrix equation to solve for these three numbers.

$2x=-y \Rightarrow 2x+y+0z=0$

$3y-z=20 \rightarrow 0x+3y-z=20$

$x+z=-5 \rightarrow x+0y+z=-5$

$$\begin{bmatrix} 2 & 1 & 0 \\ 0 & 3 & -1 \\ 1 & 0 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix}=\begin{bmatrix} 0 \\ 20 \\ -5 \end{bmatrix}$$

A B

$A^{-1}B=\begin{bmatrix} -3 \\ 6 \\ -2 \end{bmatrix}$ $(-3,6,-2)$

64. Using the graph below, identify the domain, range, intervals of increasing, decreasing and/or constant. Then evaluate at the given values.

a) Domain: $(-\infty,\infty)$

b) Range: $[-2]\cup[0,\infty)$

c) Increasing: $(0,\infty)$

d) Decreasing: $(-3,0)$

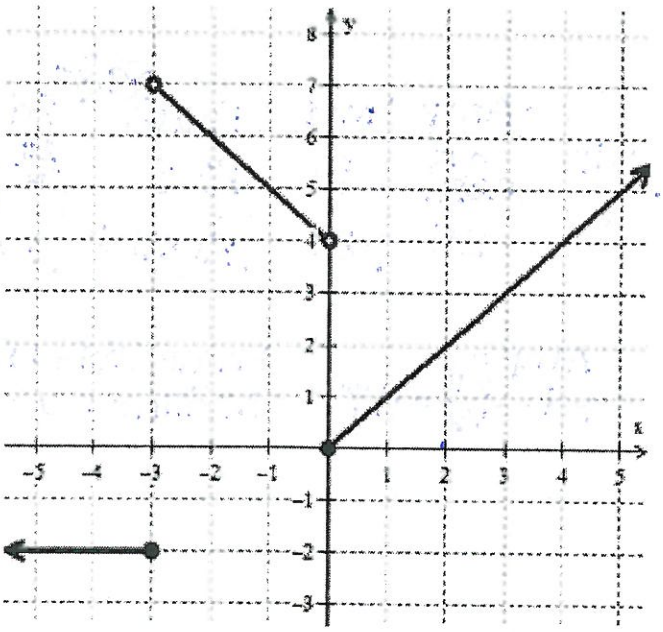
e) Constant: $(-\infty,-3)$

f) f(-4) = -2

g) f(0) = 0

h) f(2) = 2

i) If f(x)= 2, the x = 2



65. Write an equation to represent the piecewise function in number 64.

$$f(x)=\begin{cases} -2 \; ; \; x\le -3 \\ -x+4 \; ; \; -3<x<0 \\ x \; ; \; x\ge 0 \end{cases}$$

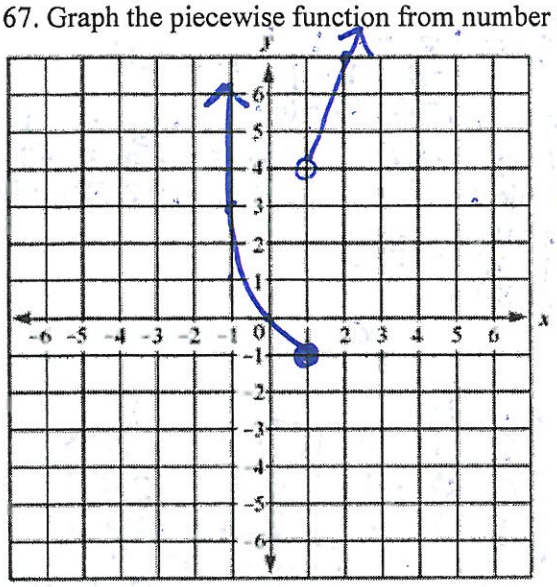
66. Evaluate the piecewise function for f(-2), f(1), and f(4). $f(x)=\begin{cases} x^2-2x, \; if \; x\le 1 \\ 3x+1, \; if \; x>1 \end{cases}$

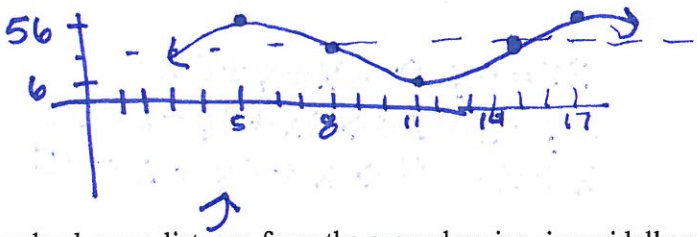
$f(-2)=8$

$f(1)=-1$

$f(4)=13$

67. Graph the piecewise function from number 66 above.





68. You've probably noticed that as you ride a Ferris wheel, your distance from the ground varies sinusoidally with time. When the last seat is filled and the Ferris wheel starts, your seat is at the position shown in the diagram below. Let t be the number of seconds that have elapsed since the Ferris wheel started. You find that it takes you 5 seconds to reach the top, 56 feet above the ground, and that the wheel makes a revolution once every 12 seconds. The diameter of the wheel is 50 feet. Write an equation to represent this function (sine or cosine) and use it to predict your height above the ground after 10 seconds. 59.35

	AMP	Mid	Phase	Pd	Equation
Sin	25 Refl.	31	Rt. 8	$\frac{2\pi}{B}=12$ $B=\pi/6$	$y=-25\sin(\frac{\pi}{6}(x-8))+31$
COS	25	31	Right 5	$B=\pi/6$	$y=25\cos(\frac{\pi}{6}(x-5))+31$

69. State the amplitude and period, phase shift and midline for the equation $y=-\cos\left(\frac{1}{2}\left(\theta-\frac{\pi}{2}\right)\right)-2$

Amp = 1 Phase Shift: Right $\pi/2$

Pd = $\frac{2\pi}{1/2}=4\pi$ Midline: $y=-2$

70. Look back at the website www.afmfinance.weebly.com and review all the terms and concepts introduced in modules 1-5.

FORMULAS:

$a^2=b^2+c^2-2bc\cos A$

$n(t)=ne^{rt}$

$\frac{\sin A}{a}=\frac{\sin B}{b}=\frac{\sin C}{c}$

$m(t)=me^{-rt}$

$s=r\theta$

$A=Pe^{rt}$

$r=\frac{\ln 2}{\text{half-life}}$

$A=\frac{1}{2}r^2\theta$

$A=P(1+\frac{r}{n})^{nt}$