AFM Midterm Review Name: Key

1. Write an exponential function to model this situation: a population of 420 animals **decrease** at an annual rate of 21%. Then predict the value of the function after 5 years (to the nearest whole number).
   A) $f(x) = 420(0.79)^x$; 1659 animals
   B) $f(x) = 420(1.21)^x$; 2541 animals
   C) $f(x) = 420(0.79)^x$; 129 animals
   D) $f(x) = 420(1.21)^x$; 1089 animals

2. Evaluate the expression: $\log_5 1$ $= x$, $5^x = 1$
   A) -1 B) 1 C) 0 D) 5

3. Given a triangle with b = 5, c = 6, and A = 122°, what is the length of a? (Round to 2 decimal places.) L.O.C
   A) 5.36 B) 9.63 C) 5.4 D) 8.77
   $x^2 = 6^2 + 5^2 - 2(6)(5)\cos(122)$

4. How many triangles can be constructed with ∠B = 70°, a = 5, and b = 3 ?
   A) 0 B) 1 C) 2 D) 3
   $\frac{\sin 70}{3} = \frac{\sin x}{5}$

5. From the top of a 120 ft lighthouse, the angle of depression to a ship in the ocean is 15°. How far is the ship from the base of the lighthouse?
   A) 769 feet B) 448 feet C) 464 feet D) 32 feet
   $\tan 15 = \frac{120}{x}$

6. A 90 ft tree casts a shadow that is 20 feet long. What is the angle of elevation of the sun (to the nearest degree)?
   A) 13° B) 77° C) 90° D) 62°
   $\tan^{-1}(90/20)$

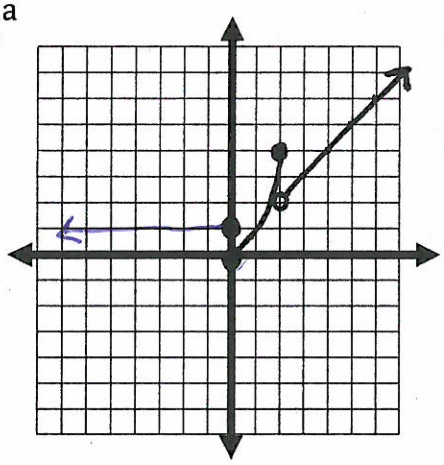
7. The sides of a triangle are 21, 36, and 33 m. Find the largest angle.
   A) 82.3° B) 79.3° C) 81.3° D) 80.3°
   $36^2 = 21^2 + 33^2 - 2(21)(33)\cos(x)$

8. Find f(-2) when $f(x) = -3x^2 - 2x$. $-3(-2)^2 - 2(-2)$
   A) -16 B) 20 C) -8 D) 12

9. Find $\frac{f(a+h) - f(a)}{h}$ when $f(x) = 5x^2 + 2$
   A) 10h + 5a
   B) 5h + 10a
   C) 5h + 5a
   D) 10h – 5a
   $5(a+h)^2 + 2$
   $5(a^2 + 2ah + h^2) + 2$
   $\frac{5a^2 + 10ah + 5h^2 + 2 - 5a^2 - 2}{h}$
   $\frac{10ah + 5h^2}{h}$
   $10a + 5h$

10. Evaluate the following piecewise defined function at f(0), f(2), and f(8).
    $f(x) = \begin{cases} 6 & \text{if } x < 2 \\ 3x-8 & \text{if } x \geq 2 \end{cases}$
    A) f(0)=6, f(2) = -2, f(8)= 32
    B) f(0)= -8, f(2)=6, f(8)= 6
    C) f(0)=6, f(2)= 2, f(8)= 16
    D) f(0)=6, f(2) = -2, f(8)= 16
    $f(0) = 6$
    $f(2) = 3(2) - 8 = -2$
    $f(8) = 3(8) - 8 = 16$

11. Which of the following formulas is a formula for the function y = f(x) shown at the right?



A) $f(x)=\begin{cases}-1, x<0\\ \sqrt{x}, 0\le x<2\\ x, x\ge 2\end{cases}$ B) $f(x)=\begin{cases}1, x\le 0\\ x^2, 0\le x\le 2\\ x, x>2\end{cases}$ C) $f(x)=\begin{cases}1, x<0\\ x^2, 0\le x<2\\ x, x\ge 2\end{cases}$ D) $f(x)=\begin{cases}1, x<0\\ x^2, 0\le x<2\\ x+1, x\ge 2\end{cases}$

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

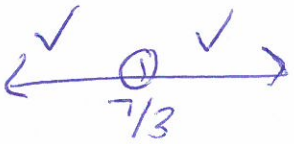
A) $(-\infty,\frac{7}{3}]$

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

C) $(-\infty,\frac{7}{3})\cup(\frac{7}{3},\infty)$

D) $(\frac{7}{3},\infty)$

$3x-7=0$
$x=7/3$

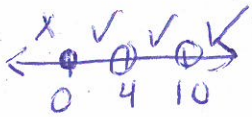


13. Find the domain of the following function:

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

$x=0$

$x^2-14x+40=0$
$(x-4)(x-10)$
$x=4,\ x=10$



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

14. 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?

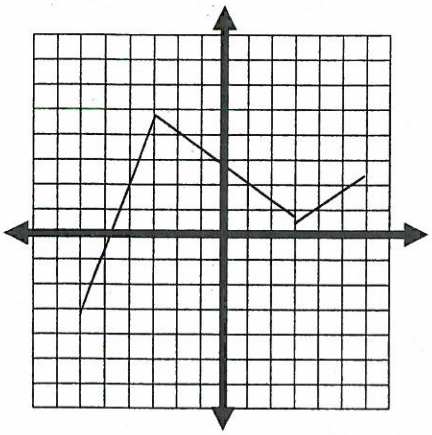
A) $152.00
B) $182.00
C) $158.60
D) $171.60

$\begin{cases}.70x & x\le 100\\ 70+.65(x-100) & 100<x\le 200\\ 135+.61(x-200) & x>200\end{cases}$

15. 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?

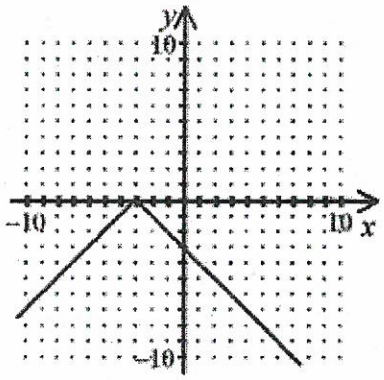
A) $g(x)=3-\sqrt{x+2}$
B) $g(x)=3+\sqrt{-x+2}$
C) $g(x)=3-\sqrt{x-2}$
D) $g(x)=3+\sqrt{x+2}$

16. The graph of a function is given to the side.
Determine the interval on which the function is increasing.



A) (-3, 3)
B) (-3, 5) U (1, 3)
C) (-6, -3) U (3, 6)
D) (-6, 6)

17. This graph represents a translation of the graph of $y=|x|$. What is the equation of this graph?



A) $y=|x-3|$ B) $y=-|x-3|$ C) $y=|-x+3|$ D) $y=-|x+3|$

18. Evaluate: $\log_5\left(\frac{1}{125}\right)$ $5^x=\frac{1}{125}$

A. 3 B. -3 C. -4 D. $\frac{1}{3}$

19. A house bought five years ago for $100,000 was just sold for $135,000. To the nearest tenth of a percent, what was the annual growth rate? $135000=100000(1+r)^5$

A. 6.2% B. 106.2% C. 93.8% D. 35%

20. The half-life of a certain radioactive material is 85 days. An initial amount of the material has a mass of 801 kg. Find how much radioactive material remains after 10 days. Round your answer to the nearest thousandth.

A. 0.228 kg B. 0 kg C. 738.273 kg D. 0.782 kg

$A=801e^{-\ln 2/85\cdot 10}$

21. How many years will it take for \$1600 to grow to \$28,900 at an interest rate of 4.4% if the interest rate is compounded quarterly? Round the number of years to the nearest hundredth.

A. 67.21 years B. 66.13 years C. 264.52 years D. 412.77 years

$28900 = 1600\left(1 + \frac{.044}{4}\right)^{4t}$

22. Solve $2^x = 53$. Round the solution to the nearest hundredth.

A. 1.42 B. −1.42 C. 5.73 D. 9.97

$x \log 2 = \log 53$, $\frac{x \log 2}{\log 2} = \frac{\log 53}{\log 2}$

23. Solve $\log_4 11.2 = x$. Round the solution to the nearest hundredth.

A. 0.57 B. 1.74 C. 0.05 D. 0.25

$4^x = 11.2$

$x \log 4 = \log 11.2$, $\frac{x \log 4}{\log 4} = \frac{\log 11.2}{\log 4}$

24. 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) $27^{\frac{2}{3}} = 9$

25. 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) $\log_{16} \frac{1}{2} = 4$

26. Evaluate: $\log_6 216 =$ 3

$6^x = 216$

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

a) $\log(x+1) + \log(4) = \log(2x+10)$

$\log 4x + 4 = \log 2x + 10$

$4x + 4 = 2x + 10$

x = 3

b) $\log_4(3x-2) = 3$

$64 = 3x - 2$

x = 22

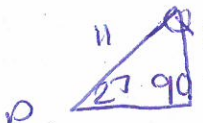
c) $e^{4x-1} = 9$

$4x - 1 = \ln 9$

x = 0.799

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

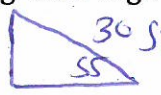
a) 24.2 b) 5.6 c) 9.8 d) 5.0



$\sin 27 = \frac{x}{4}$

29. 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?

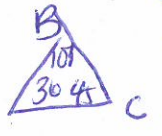
a) About 52.30 ft b) about 17.21 ft c) about 24.57 ft d) about 42.8 ft



$30 \sin 55 = x$, $\frac{30}{30}$

30. In ΔABC, find c if $\angle A = 36°$, $\angle B = 101°$, and $b = 42.7$.

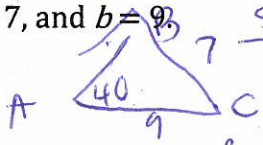
a) about 40.2 b) about 29.7 c) about 25.3 d) about 31.8



$\frac{\sin 45}{x} = \frac{\sin 101}{42.7}$

31. Determine the number of possible solutions for ΔABC, given $\angle A = 40°$, $a = 7$, and $b = 9$.

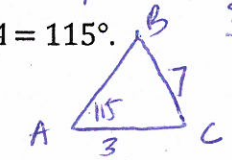
a) two b) one c) three d) none



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

32. Determine the number of possible solutions for ΔABC, given $a = 7$, $b = 3$, and $\angle A = 115°$.

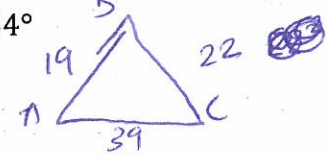
a) two b) one c) three d) none



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

33. In ΔABC, given $a = 22$, $b = 39$ and $c = 19$, find B.

a) about 144° b) about 126° c) about 36° d) about 54°



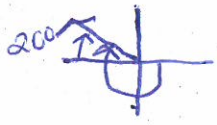
$39^2 = 22^2 + 19^2 - 2(22)(19)\cos B$

34. 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

$S = 6\left(\frac{\pi}{10}\right)$

$18 \cdot \frac{\pi}{180}$

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

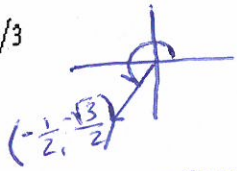


36. A sector has an area of 14.5 square meters. The radius of the circle is 4 meters. Find the radian measure of the central angle to the nearest tenth.
a) 7.3 radians b) 14.6 radians c) 1.8 radians d) 3.6 radians

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

$\frac{14.5}{8} = \frac{8\theta}{8}$

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



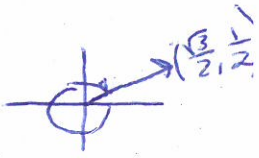
$\frac{-\frac{\sqrt{3}}{2}}{-\frac{1}{2}} \cdot \frac{-2}{1} = \sqrt{3}$

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

$-2100 - 360 - 360 - 360 - 360 - 360$

39. Find the terminal point of $t = \frac{-11\pi}{6}$..

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) $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$



40. 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 (−x, +y)

41. Convert to radians: $-105°$
a) $\frac{7\pi}{12}$ b) $\frac{-7\pi}{12}$ c) $\frac{7\pi}{6}$ d) $\frac{-12}{7\pi}$

$-105 \cdot \frac{\pi}{180} = -\frac{7\pi}{12}$

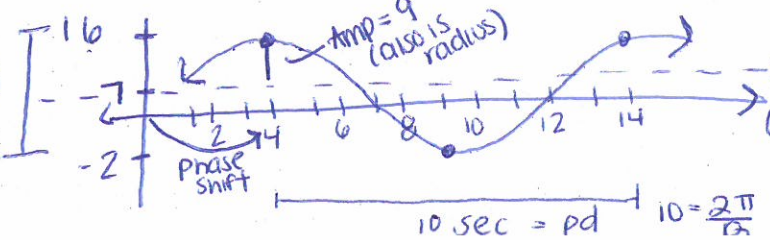
42. State the amplitude and period for the function $y = -3\sin 3\theta$.
a) -3; $\frac{3\pi}{2}$ b) -3, $\frac{2\pi}{3}$ c) 3, $\frac{3\pi}{2}$ d) 3, $\frac{2\pi}{3}$

$A = 3$ (amp always positive!)

$Pd = \frac{2\pi}{B} = \frac{2\pi}{3}$

43. Mark Twain sat on the deck of a river steamboat. As the paddlewheel turned, he noticed a dead fish caught on one of the paddles. As the wheel turned, the distance, d, that the fish was from the water's surface was a sinusoidal function of time. When his stopwatch read 4 seconds, the fish was at its highest, 16 feet above the water's surface. It took another 10 seconds before the fish reached that height again. The diameter of the wheel was 18 feet. Write a sine or cosine equation to model this scenario.

Diameter Top to bottom 18



$10 = \frac{2\pi}{B}$ $B = \frac{\pi}{5}$

$y = 9\cos\left(\frac{\pi}{5}(x-4)\right) + 7$

amp B (from pd) phase shift Midline