

ACTM State Algebra II Exam
April 24, 2010

Place the letter of the correct answer in the space provided as well as on the answer sheet. Make sure you attempt the tie-breaker questions at the end of the test if you have time.

_____ 1. Find the equation of the line that passes through the point (2,-3) and has a slope of 4.

- a.) $y = 4x + 11$ b.) $y = 4x - 11$ c.) $y = 4x - 5$ d.) $y = 4x + 5$

_____ 2. Solve the inequality $1 - \frac{4x}{5} \leq 2x + 3$

- a.) $x \leq \frac{5}{7}$ b.) $x \geq \frac{5}{7}$ c.) $x \leq -\frac{5}{7}$ d.) $x \geq -\frac{5}{7}$

_____ 3. If you invest \$300 in an account paying 3.1% compounded continuously, how long will it take your money to double?

- a.) 22.4 years b.) 19.5 years c.) 37.4 years d.) 8.6 years

_____ 4. The domain of the function $f(x) = \ln(2-x)$ is

- a.) $(-\infty, 2)$ b.) $(-2, \infty)$ c.) $(-\infty, -2)$ d.) $(2, \infty)$

_____ 5. The horizontal asymptote for the function $\frac{3x+5}{5x+10}$ is at

- a.) -2 b.) -5/3 c.) 1/2 d.) 3/5

_____ 6. Find the inverse of $f(x) = \ln x^3$.

- a.) $f^{-1}(x) = e^{\frac{x}{3}}$ b.) $f^{-1}(x) = e^{3x}$ c.) $f^{-1}(x) = e^{x^3}$ d.) $f^{-1}(x) = \sqrt[3]{x}$

_____ 7. The solutions to $f(x) = x^4 - 1$ are

- a.) $\pm 1, \pm 2i$ b.) $\pm 1, \pm 4i$ c.) $\pm 1, \pm i$ d.) $\pm i, \pm 2i$

_____ 8. Solve the following equation for x : $\log_2(x) + \log_2(x-3) = 2$

- a.) $x = 1$ b.) $x = 4$ or $x = -1$ c.) $x = 4$ d.) $x = 3$ or $x = 4$

_____9. Tim and Robert work at Grand Avenue car wash. Tim can wash and detail a car in 45 minutes. Robert can wash and detail a car in 70 minutes. Working together, how long will it take Tim and Robert to wash and detail a car?

- a.) 35 minutes b.) 57.5 minutes c.) 115 minutes d.) 27.4 minutes

_____10. An urn contains 100 marbles. Thirty of the marbles are blue, 57 are red, and the rest are green. If one marble is randomly drawn from the urn, what is the probability that it is not green?

- a.) 0.13 b.) 0.57 c.) 0.87 d.) 0.30

_____11. Perform the indicated operation and simplify: $(1 - 3i)^2$

- a.) $10 - 6i$ b.) $1 + 3i$ c.) $-8 - 6i$ d.) $1 + 9i$

_____12. If $f(x) = x^2 - x - 3$, find and simplify $\frac{f(x+h) - f(x)}{h}$

- a.) $2x - 1$ b.) $2x + h - 1$ c.) $x + h$ d.) $x - h - 3$

_____13. If $f(x) = x^2 - 7$ and $g(x) = \frac{1}{\sqrt{x}}$, find $f \circ g$

- a.) $x^2 - 7 + \frac{1}{\sqrt{x}}$ b.) $\frac{1}{x} - 7$ c.) $g(x) = \frac{1}{\sqrt{x^2 - 7}}$ d.) $\frac{1}{\sqrt{x}} - 7$

_____14. A chemist has at hand two acid solutions. Solution A is 30% acid, and solution B is 65% acid. How much of each solution does she need to make 40 ml of 50% acid solution?

- a.) 20 ml of A, 20 ml of B b.) 12 ml of A, 26 ml of B
c.) 15.5 ml of A, 24.5 ml of B d.) 17.1 ml of A, 22.9 ml of B

____ 15. The vertex of the parabola described by $f(x) = 4x^2 - bx + 7$ is

- a.) $\left(\frac{b}{8}, \frac{-b^2}{16} + 7\right)$ b.) $\left(\frac{b}{8}, \frac{b^2}{16} + 7\right)$ c.) $\left(\frac{-b}{8}, \frac{b^2}{16} + 7\right)$ d.) $\left(\frac{-b}{8}, \frac{-b^2}{16} + 7\right)$

____ 16. Rewrite the expression as the logarithm of a single quantity:

$$2[\ln x - 3\ln(x+1)] + \ln(x-1)$$

- a.) $2\ln x(x+1)(x-1)$ b.) $\ln\left(\frac{x}{(x+1)^3}\right)^2(x-1)$ c.) $\ln\left(\frac{x(x-1)}{x+1}\right)^2$ d.) $\ln 2\left(\frac{x(x-1)}{x+1}\right)$

____ 17. What value of x will make the determinant of $\begin{bmatrix} 3 & -4 \\ x & 5 \end{bmatrix}$ equal to 23?

- a.) $x = 2$ b.) $x = \frac{-19}{2}$ c.) $x = \frac{19}{2}$ d.) $x = 4$

____ 18. Solve for x : $\log_3 x + \log_3(x^2 - 8) = \log_3 8x$

- a.) $x = 0, x = -4, x = 4$ b.) $x = 0, x = -2\sqrt{2}, x = 2\sqrt{2}$
c.) $x = 4$ d.) $x = 4, x = -4$

____ 19. Organic green beans cost three times as much as their non organic counterpart. A customer buys 4 pounds of non organic beans and 1.5 pounds of organic beans for a total cost of \$5.53. What is the cost per pound of the non organic beans?

- a.) \$1.94 b.) \$3.30 c.) \$0.65 d.) \$0.52

____ 20.. The coefficient in front of the x^5 term in $(x+2)^7$ is

- a.) 21 b.) 7 c.) 42 d.) 84

____ 21. . Solve the inequality and write the final answer in interval notation: $|x^2 - 2| < x$.

- a.) $(-\infty, -\sqrt{2}) \cup (\sqrt{2}, \infty)$ b.) (1,2) c.) (-1,1) d.) $(\sqrt{2}, \infty)$

_____22. Find the equation of the line that passes through the point (3,-4) and is perpendicular to the line $y = -3x + 5$.

a.) $y = -\frac{1}{3}x - 5$

b.) $y = \frac{1}{3}x - 5$

c.) $y = -3x - 5$

d.) $y = 3x - 5$

TIEBREAKERS

Name _____

Show all your work to receive maximum credit.

1. The sales (S) in thousands of units of a product after x hundred dollars is spent on advertising is $S = 10(1 - e^{kx})$. When \$500 is spent on advertising, 2500 units are sold. Solve for k , then estimate the number of units sold if \$700 is spent on advertising.

Name _____

2. The height at time t of a projectile is described by the equation $s = \frac{1}{2}at^2 + v_0t + s_0$, where a is the acceleration due to gravity, v_0 is the initial velocity of the projectile, and s_0 is its original height. If we know that $s=52$ ft at $t=1$ second, $s=52$ feet at $t=2$ seconds, and $s=20$ feet at $t=3$ seconds, find the values of a , v_0 , and s_0 .

Name _____

3. Show that the horizontal asymptote of $f(x) = \frac{3x-5}{x^2+x-2}$ must be the x-axis.

ANSWERS

1. b
2. d
3. a
4. a
5. d
6. a
7. c
8. c
9. d
10. c
11. c
12. b
13. b
14. d
15. a
16. b
17. a
18. c
19. c
20. d
21. b
22. b

Tiebreaker 1

$k=-0.058$

$S=3337$

Tiebreaker 2

$a=-32$ ft/sec/sec, $v_o=48$ ft/sec, and $s_o=20$ ft.

Tiebreaker 3

Show that as $x \rightarrow \infty$, $f(x) \rightarrow 0$