

Math 110: Final Exam Version A
Fall 2018

- Calculators are NOT allowed.
- Please code true/false and multiple choice answers on a scantron. These are questions 1 - 10.
- Since you have test version A, please code the "Page Number" on the scantron as 1.
- No partial credit for multiple choice / no work needs to be shown.
- For short answer questions, you must show work for full and partial credit.
- Multiple choice and true / false problems are worth 4 points each. Free response questions are worth 6 points each.
- Sign the honor pledge below after completing the exam.
- Please put all work to be graded on the test itself.

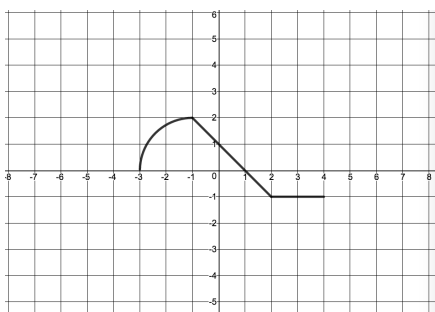
First and last name

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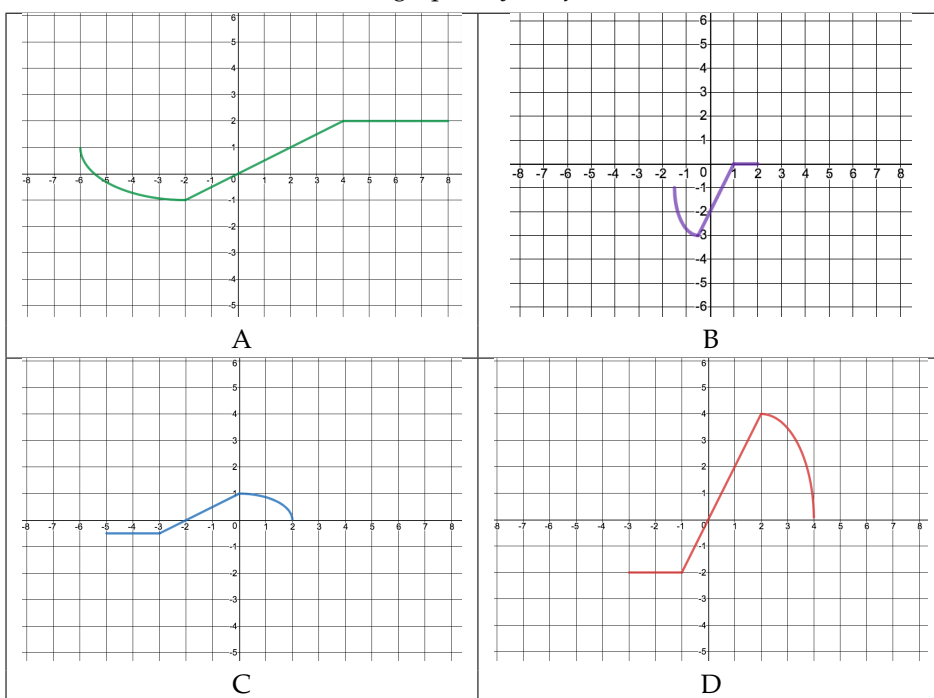
Honor Pledge: I have neither given nor received unauthorized help on this exam.

Signature:

1. The graph of the function $y = f(x)$ is shown below.



Use transformations to draw the graph of $y = -f(2x) - 1$.

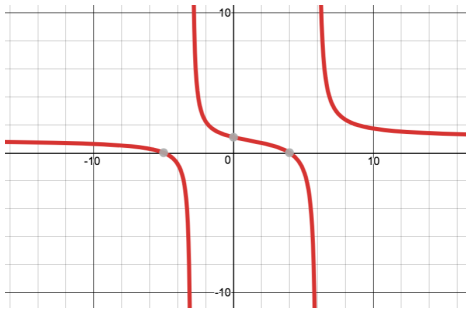


2. Simplify and write the answer without negative exponents.

$$\left(\frac{32x^{-7}y^{-8}}{x^{-2}y^2}\right)^{2/5}$$

- A. $\frac{4}{x^2y^4}$
- B. $\frac{1}{4x^2y^4}$
- C. $\frac{32x^{14}}{y^{16}}$
- D. $\frac{64}{5x^7y^4}$
- E. $\frac{64y^{12/5}}{5x^{18/5}}$

3. Find the equation of the graph.



A. $y = \frac{(x-4)}{(x+3)(x-6)}$

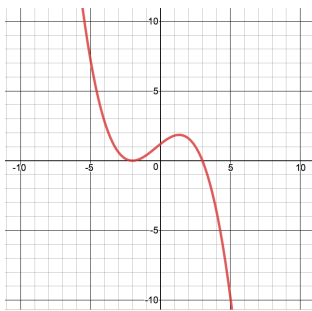
B. $y = \frac{(x-4)}{(x-1)(x-2)}$

C. $y = \frac{(x-4)(x+5)}{(x-1)(x-2)}$

D. $y = \frac{(x+3)(x-6)}{(x+5)(x-4)}$

E. $y = \frac{(x+5)(x-4)}{(x+3)(x-6)}$

4. Find the equation of the graph:



A. $y = -\frac{1}{10}(x+2)(x-3)$

B. $y = \frac{1}{10}(x+2)(x-3)$

C. $y = -\frac{1}{10}(x+2)^2(x-3)$

D. $y = \frac{1}{10}(x+2)(x-3)^2$

E. $y = -\frac{1}{10}(x+2)^2(x-3)^2$

5. Find the equation of a line that is perpendicular to the line $3x + 4y = 7$ and goes through the point $(6, 5)$.

A. $3x - 4y = -2$

B. $4x - 3y = 7$

C. $4x - 3y = 9$

D. $4x + 3y = 7$

E. $4x + 3y = 39$

6. For the functions $f(x) = x^2 + x$ and $g(x) = \frac{1}{x+4}$, find an expression for $f \circ g(x)$.

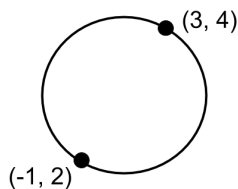
- A. $\frac{1}{x^2 + x + 4}$
- B. $\frac{1}{(x+4)^2 + x}$
- C. $\frac{x+5}{(x+4)^2}$
- D. $\frac{x^2 + x}{x+4}$
- E. $\frac{x^3 + 4x^2 + 1}{x+4}$

7. Solve the inequality. Write your answer in interval notation.

$$2|3 - 2x| + 1 > 5$$

- A. $(0, \infty)$
- B. $(-\frac{1}{2}, \frac{1}{2})$
- C. $(\frac{1}{2}, \frac{5}{2})$
- D. $(-\infty, \frac{1}{2}) \cup (3, \infty)$
- E. $(-\infty, \frac{1}{2}) \cup (\frac{5}{2}, \infty)$

8. The two points $(3, 4)$ and $(-1, 2)$ lie on a circle, on opposite sides of a diameter. Find the equation of the circle.



- A. $(x - 1)^2 + (y - 3)^2 = 5$
- B. $(x + 1)^2 + (y + 3)^2 = 20$
- C. $(x - 1)^2 - (y - 3)^2 = 25$
- D. $(x - 1)^2 + (y - 3)^2 = \sqrt{5}$
- E. $(x + 2)^2 + (y + 1)^2 = \sqrt{20}$

9. A model rocket is launched and its height in meters at time t seconds is given by the equation $h(t) = 6t - 3t^2$. Find the time(s) at which the height of the rocket is 2 meters.

- A. $t = -2$
- B. $t = 1$
- C. $t = 2$
- D. $t = 1, 2$
- E. $t = 1 + \frac{\sqrt{3}}{3}, 1 - \frac{\sqrt{3}}{3}$

10. Use log properties to write the following expression as a single log. You may assume that all variables are positive.

$$\frac{1}{2} \log(x + 5) - 8 \log(x) + 2 \log(y)$$

A. $\log\left(\frac{(x + 5)^{1/2}}{x^8 y^2}\right)$

B. $\log\left(\frac{(x + 5)^{1/2} y^2}{x^8}\right)$

C. $\log\left(\frac{(x + 5)y}{8x}\right)$

D. $\log\left(\frac{1}{2}(x + 5) - 8x + 2y\right)$

E. $\log\left((x + 5)^{1/2} - x^8 + y^2\right)$

11. TRUE or FALSE and justify your answer.

(a) $\log(x - y) = \frac{\log(x)}{\log(y)}$. (circle one) TRUE or FALSE

Explanation / Counterexample

(b) The equation $4|x + 5| < -2$ has no solutions. (circle one) TRUE or FALSE

Explanation / Counterexample

(c) $\sqrt{a^2 + 25} = a + 5$. (circle one) TRUE or FALSE

Explanation / Counterexample

12. Find the domain of the function $f(x) = 2\sqrt{x^2 - 3x - 10}$. Write your answer in interval notation.

Answer:

13. The population of spiders on an island (in millions) is growing according to the equation $y = 30e^{0.05t}$. If this growth rate continues, find the amount of time it will take the population to double. Write your answer in a form that you could type into your calculator.

Answer:

14. Simplify:

$$\frac{\frac{1}{6+x} - \frac{1}{6}}{\frac{x}{3}}$$

Answer:

15. Solve for y : $y - 4 = \sqrt{31 - 6y}$

Answer:

16. Solve for y . Your answer should be in terms of x .

$$x = \frac{2 - y}{3y + 1}$$

Answer:

17. Find the values of the expressions. Write DNE if the value is undefined.

(a) $\log_2 \frac{1}{8} =$

(b) $\log_9 3 =$

(c) $\log_4 0 =$

(d) $\ln e^2 =$

(e) $5^{\log_5 10} =$

18. Choose ONE of the problems below and SET UP a system of two equations in two unknowns that you could use to solve it. You DO NOT need to finish solving the problem. Please circle the problem you choose.
- (a) Xavier and Yolanda leave at the same time and bicycle towards each other from towns 40 miles apart. Yolanda bikes 2 miles per hour faster than Xavier. They meet somewhere in between after 2 hours of biking. How fast do they each bike?
 - (b) A chemical company makes two brands of antifreeze. The first brand is 35% pure antifreeze, and the second brand is 60% pure antifreeze. In order to obtain 70 gallons of a mixture that contains 40% pure antifreeze, how many gallons of each brand of antifreeze must be used?

19. The amount of coffee beans in a coffee shop decreases at a constant rate. On November 4 there were 105 pounds of coffee beans in the shop. On November 11 there were 70 pounds of coffee beans.

(a) Write an equation to express the pounds of coffee beans C in terms of time t since the end of October.

Answer:

(b) If this rate continues, and no more coffee beans are brought in, when will the shop run out of coffee beans?

Answer:

20. A wedding dress was purchased for \$1200. Suppose that its value decreases by a fixed percent each year, and two years after purchase, the value is \$900. Write an equation to express the value V in terms of the time in years t since purchase. Your equation should only have two variables: V and t .

Answer:

21. Find the x and y intercepts of the graph of $y = \log_3(x^2 + 1) - 2$

x-intercept(s):

y-intercept(s):

22. Solve the system of equations:

$$x^2 + 3y = 4$$

$$2x - y = 4$$

Answer: