

Name: _____

Student ID: _____

Teacher: _____

1 2 3 4 5 6 7 8 9 10

11 12 13 14 15 16 17 18 19 20

Total:

Answer the questions in the spaces provided, and use the back of the pages if necessary. Show all work for full credit. No notes, books, scratch paper, calculators, or other electronic devices are allowed. To avoid distraction and disruption your instructor will be unable to answer questions during the exam. Each problem is worth 5 points. There are 20 problems and 100 points possible.

Please Box Your Answers

Some formulas that may be useful:

An amount P invested at an annual rate r (percentage divided by 100) compounded n times per year will grow in t years according to the formula

$$S = P \left(1 + \frac{r}{n} \right)^{nt}.$$

The sum S_n of the first n terms of an arithmetic sequence a_1, a_2, a_3, \dots is

$$S_n = \frac{n}{2}(a_1 + a_n).$$

1. Simplify (i.e. reduce) the rational expression:

$$\frac{\frac{1}{a+b}}{\frac{1}{a} + \frac{1}{b}}$$

2. Solve:

$$\sqrt{3-x} = 2x + 4$$

3. Find all roots of $f(x) = 2x^3 - x^2 - 6x$.

4. Find the domain of the function $f(x) = 2\sqrt{x+3}$.

5. Let $f(x) = 4x - 1$ and $g(x) = x^2 + x$. Find $(f \circ g)(-2)$.

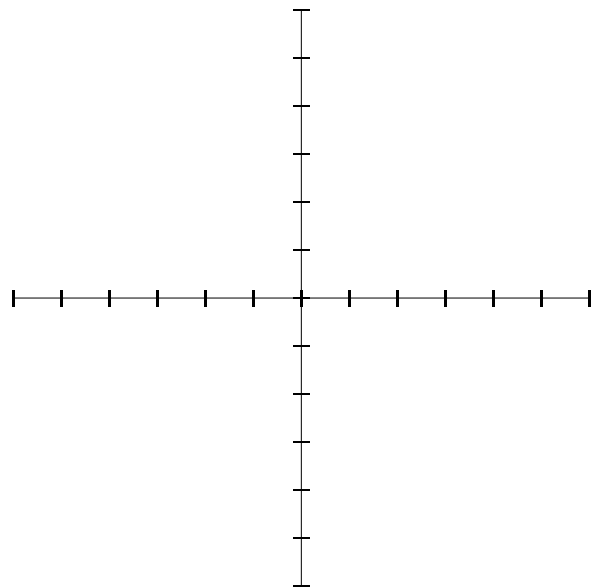
6. Find the slope-intercept equation of the line through $(2, 3)$ and perpendicular to the line $y = 2x - 3$.

7. A company's costs for manufacturing x units of a product are given by

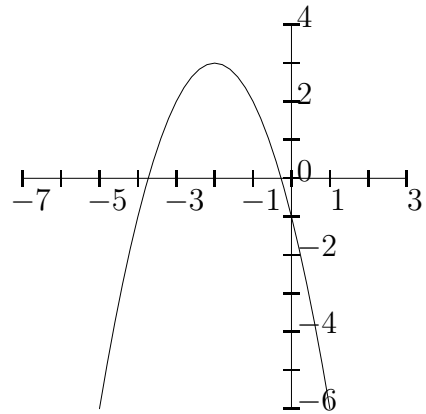
$$C(x) = x^2 - 16x + 100.$$

Find the minimum costs incurred by the company by making this product and the production level that achieves this.

8. Sketch a graph of $f(x) = \frac{3x}{x-2}$ below. Be sure to scale your axes.



9. The parabola below is the graph of a quadratic (second degree) polynomial. Find the equation for this function.



10. Find x in each of the logarithm equations below (you're answers should not involve a logarithm):

(a) $\log_3\left(\frac{1}{9}\right) = x$

(b) $\log_2 x = 16$

(c) $\ln(e^2) = x$.

11. Solve: $\log_8(y - 5) + \log_8(y + 2) = 1$.

12. Use logarithm properties to write the following in terms of $\ln x$, $\ln y$, and $\ln z$.

$$\ln\left(\frac{\sqrt{xy}}{z^2}\right)$$

13. You make a one time deposit of \$250 into a savings account which yields an annual interest rate of 4.25% compounded monthly. Give an expression for the number of years you will have to wait until your account contains \$5,000.

14. Let

$$A = \begin{bmatrix} 3 & 2 & 1 \\ -5 & 0 & -2 \end{bmatrix}, \text{ and } B = \begin{bmatrix} 1 & 0 \\ -1 & 3 \\ 2 & -1 \end{bmatrix}.$$

What is AB ?

15. Find the determinant of

$$A = \begin{bmatrix} 2 & 1 & 0 \\ -1 & 3 & 2 \\ 0 & -2 & 1 \end{bmatrix}.$$

16. Solve the following system of equations:

$$\begin{aligned}x + y - z &= -2 \\x + 4y + z &= 1 \\x - 2y - z &= 1\end{aligned}$$

17. Evaluate the summation:

$$\sum_{j=1}^3 (j^2 + j)$$

18. One day you leave your house and find 3 marbles on the front mat. The next day you find 7 marbles, and the day after that there are 11 marbles.
- (a) How many marbles will you expect on the 8th day?
 - (b) After 8 days, what is the total number of marbles that you will have acquired?

19. Your family has seven members. In how many different ways can you pick three members to go grocery shopping?

20. In the expansion of $(x - 2)^8$, what is the coefficient of x^3 . (You will want to use the binomial theorem.)