

## MATH 110 Sample 02 Exam 2

**For each problem, show your work in the space provided.  
Write your Final Answer (and the letter answer) on the Answer Sheet provided.**

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1. Evaluate:  $\log_6\left(\frac{1}{36}\right)$       [A] -2      [B] -3      [C] 3      [D] 2

2. Write as a single logarithm:  $4 \log_b x - 6 \log_b y$

[A]  $\log_b(x^4 y^6)$       [B]  $\log_b\left(\frac{4x}{6y}\right)$       [C]  $\log_b\left(\frac{x^4}{y^6}\right)$       [D]  $\log_b(24xy)$

3. Write as the logarithm of a single expression:  $\log_c 5x + 5(\log_c x - \log_c y)$

[A]  $\log_c \frac{5x^6}{y^5}$       [B]  $\log_c \frac{25x^2}{y}$       [C] none of these      [D]  $\log_c \frac{10x}{5y}$

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4. Express in terms of logarithms of  $x$ ,  $y$ , and  $z$ :  $\log_a \frac{3xy^3}{z^5}$

5. Evaluate:  $\ln\left(\frac{1}{\sqrt[5]{e}}\right)$       [A] 6      [B]  $-\frac{1}{6}$       [C] -6      [D]  $\frac{1}{6}$

6. Given the change of base formula,  $\ln M = \frac{\log M}{0.43429} = 2.3026 \log M$ , find  $\ln 600$ .

[A] 7.0365      [B] 1381.56      [C] 6.3970      [D] 5.0808

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7. A radioactive substance decays so that the amount  $A$  present at time  $t$  (years) is  $A = A_0 e^{-0.3t}$ . Find the half-life (time for half to decay) of this substance. ( $\ln .5 = -0.69315$ )

[A] about 4.621 yr    [B] about 2.311 yr    [C] about 3.465 yr    [D] about 1.155 yr

8. Find all real solutions of the following equation:  $\log_3 x + \log_3(x - 6) = 3$

[A]  $x = -3, 9$     [B]  $x = 9$     [C]  $x = 3, -6$     [D] none of these

9. Solve for  $x$ :  $x^4 - 11x^2 + 10 = 0$

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Solve:

10.  $\sqrt[6]{x} = \sqrt[4]{3}$

11.  $x^2 + y^2 = 9$

$$\frac{x^2}{16} + \frac{y^2}{9} = 1$$

[A]  $\{(-4, 0), (4, 0)\}$     [B]  $\{(0, -4), (0, 4)\}$     [C]  $\emptyset$     [D]  $\{(0, -3), (0, 3)\}$

12.  $(x + 9)(x - 8) < 0$

[A]  $-8 < x < 9$

[B]  $x < -8$  or  $x > 9$

[C]  $-9 < x < 8$

[D]  $x < -9$  or  $x > 8$

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Solve:

13.  $x^2 + x \geq 6$

[A]  $x \leq -3$  or  $x \geq 2$     [B]  $-3 \leq x \leq 2$     [C]  $x \leq -2$  or  $x \geq 3$     [D]  $-2 \leq x \leq 3$

14.  $x^2 - 2x - 3 > 0$

15. Graph:  $y = x^4 - 3x^2 + 1$

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16. Solve for  $x$  by graphing:  $x^4 - 18x^2 + 17 = 0$

17. Use Descartes' Rule of Signs to determine how many positive and how many negative real zeros the polynomial functions may have. Do not attempt to find the zeros.

$$f(x) = x^6 - 2x^5 + 4x^4 - 5x^3 + 2x^2 - x + 3$$

18. List all of the potential rational zeros of the polynomial function. Do not attempt to find the zeros.  $f(x) = 3x^3 - 8x^2 + 4x + 9$

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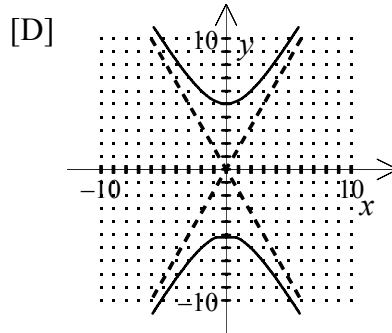
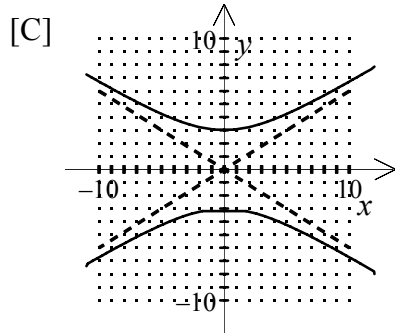
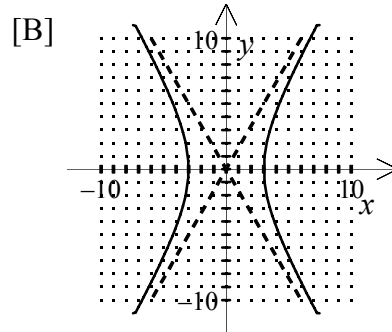
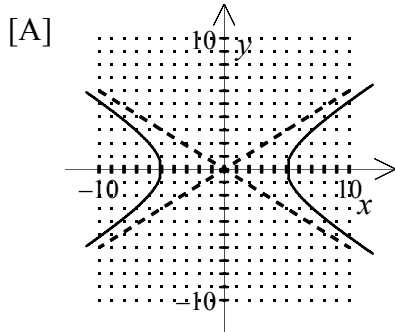
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19. Graph and show the asymptotes:  $\frac{x^2}{25} - \frac{y^2}{9} = 1$



20. Find an equation of the parabola in standard form with vertex  $(-3, -7)$ , axis of symmetry  $x = -3$ , and passing through the point  $(-5, 9)$ .

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21. If  $A = \begin{bmatrix} 2 & 4 \\ -6 & -9 \end{bmatrix}$  and  $B = \begin{bmatrix} 5 & -6 \\ -7 & -6 \end{bmatrix}$ , find  $-2A + 4B$ .

[A]  $\begin{bmatrix} -24 & -28 \\ 40 & 46 \end{bmatrix}$

[B]  $\begin{bmatrix} 7 & 9 \\ -13 & -16 \end{bmatrix}$

[C]  $\begin{bmatrix} -3 & -1 \\ 1 & -2 \end{bmatrix}$

[D]  $\begin{bmatrix} 16 & -32 \\ -16 & -6 \end{bmatrix}$

22. If  $A = \begin{bmatrix} -1 & -4 & 2 \\ -2 & -3 & 5 \\ 5 & 1 & -4 \end{bmatrix}$  and  $B = \begin{bmatrix} 4 & -3 & -4 \\ -1 & 5 & -1 \\ 2 & -3 & -2 \end{bmatrix}$ , find  $AB$ .



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23. Given  $A = \begin{bmatrix} 0 & -2 & 1 \\ -2 & -1 & 0 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 2 \\ 0 & 1 \\ 2 & -1 \end{bmatrix}$ , find  $AB$ .

[A]  $\begin{bmatrix} 2 & -2 \\ -3 & -5 \end{bmatrix}$       [B]  $\begin{bmatrix} 0 & -4 \\ 0 & -1 \\ 0 & 0 \end{bmatrix}$       [C]  $\begin{bmatrix} -4 & -4 & 1 \\ -2 & -1 & 0 \\ 2 & -3 & 0 \end{bmatrix}$       [D]  $\begin{bmatrix} 2 & -3 \\ -2 & -5 \end{bmatrix}$

24. Use matrices to solve the following system. What is the value of  $y$ ?

$$2x + 5z = -23$$

$$x + 4y + z = -20$$

$$-3x - 4y - z = 18$$

[A] 7

[B] -1

[C] -4

[D] -5

25. Find the sum of the first 15 terms of the arithmetic sequence 9, 13, 17, 21, ...

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26. Write in summation notation:  $-19 - 16 - 13 - 10 - 7 - 4 - 1$

[A]  $\sum_{j=0}^6 3j - 16$       [B]  $\sum_{j=0}^6 -19(3)^j$       [C]  $\sum_{j=0}^6 -19 + 3(j+1)$       [D]  $\sum_{j=0}^6 3j - 19$

27. Write as an indicated sum:  $\sum_{i=1}^3 (3i^2 - 2)$

[A]  $7 + 34 + 79$       [B]  $1 + 4 + 9$       [C]  $1 + 10 + 25$       [D]  $1 + 20 + 75$

28. Two urns each contain white balls and blue balls. Urn I contains two white balls and five blue balls and Urn II contains six white balls and three blue balls. A ball is drawn from each urn. What is the probability that both balls are blue?

[A]  $\frac{4}{33}$       [B]  $\frac{5}{21}$       [C]  $\frac{3}{16}$       [D]  $\frac{8}{65}$

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29. How many different arrangements can be made with the letters in the word MATH?

[A] 36

[B] 104

[C] 24

[D] 12

30. A single fair die is tossed. Find the probability of obtaining a number greater than 4.

[A]  $\frac{1}{3}$

[B]  $\frac{5}{6}$

[C] 1

[D]  $\frac{1}{6}$

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[1] \_\_\_\_\_

[2] \_\_\_\_\_

[3] \_\_\_\_\_

[4] \_\_\_\_\_

[5] \_\_\_\_\_

[6] \_\_\_\_\_

[7] \_\_\_\_\_

[8] \_\_\_\_\_

[9] \_\_\_\_\_

[10] \_\_\_\_\_

[11] \_\_\_\_\_

[12] \_\_\_\_\_

[13] \_\_\_\_\_

[14] \_\_\_\_\_

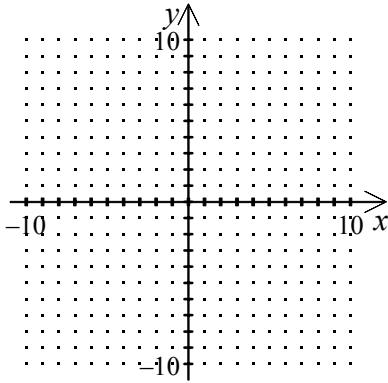
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[15] \_\_\_\_\_

[16] \_\_\_\_\_

[17] \_\_\_\_\_

[18] \_\_\_\_\_

[19] \_\_\_\_\_

[20] \_\_\_\_\_

[21] \_\_\_\_\_

[22] \_\_\_\_\_

[23] \_\_\_\_\_

[24] \_\_\_\_\_

[25] \_\_\_\_\_

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[26] \_\_\_\_\_

[27] \_\_\_\_\_

[28] \_\_\_\_\_

[29] \_\_\_\_\_

[30] \_\_\_\_\_

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NAME \_\_\_\_\_

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[1] [A] \_\_\_\_\_

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[2] [C] \_\_\_\_\_

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[3] [A] \_\_\_\_\_

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[4]  $\log_a 3 + \log_a x + 3\log_a y - 5\log_a z$  \_\_\_\_\_

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[5] [B] \_\_\_\_\_

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[6] [C] \_\_\_\_\_

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[7] [B] \_\_\_\_\_

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[8] [B] \_\_\_\_\_

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[9]  $\pm 1, \pm \sqrt{10}$  \_\_\_\_\_

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[10]  $3^{3/2}$  \_\_\_\_\_

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[11] [D] \_\_\_\_\_

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[12] [C] \_\_\_\_\_

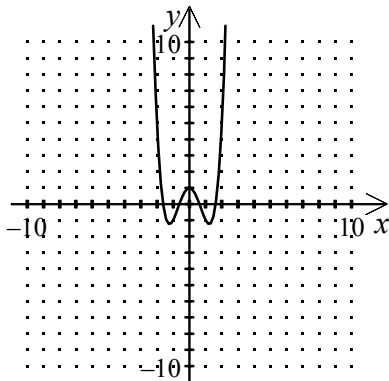
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[13] [A] \_\_\_\_\_

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[14]  $x < -1$  or  $x > 3$  \_\_\_\_\_

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[15] \_\_\_\_\_

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[16]  $\pm 1, \pm \sqrt{17} \approx \pm 4.1$  \_\_\_\_\_

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[17] 6, 4, 2, or no positive real zeros; no negative real zeros



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[18]  $\pm 1, \pm 3, \pm 9, \pm \frac{1}{3}$  \_\_\_\_\_

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[19] [A] \_\_\_\_\_

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[20]  $y = 4(x + 3)^2 - 7$  \_\_\_\_\_

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[21] [D] \_\_\_\_\_

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[22]  $\begin{bmatrix} 4 & -23 & 4 \\ 5 & -24 & 1 \\ 11 & 2 & -13 \end{bmatrix}$  \_\_\_\_\_

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[23] [D] \_\_\_\_\_

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[24] [C] \_\_\_\_\_

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[25] 555 \_\_\_\_\_

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[26] [D] \_\_\_\_\_

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[27] [C] \_\_\_\_\_

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[28] [B] \_\_\_\_\_

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[29] [C] \_\_\_\_\_

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[30] [A] \_\_\_\_\_