MATH 110 Sample 01 Exam 1

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. Write the following as the logarithm of a single expression. Assume that variables represent positive numbers.
   $\log_{11} 6 + \log_{11}(x+4) + \log_{11}(y+5)$

2. Write the equation $4^5 = 1024$ in logarithmic form.

   [A] $\log_4 1024 = 5$ [B] $\log_{1024} 4 = 5$ [C] $\log_{\frac{1}{5}} 1024 = 4$ [D] $\log_5 1024 = 4$

3. Solve: $125^{3x-1} = 25$

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

5. Write as a single logarithm: $8 \log_b x - 8 \log_b y$

   [A] $\log_b\left(\frac{x^8}{y^8}\right)$ [B] $\log_b\left(\frac{8x}{8y}\right)$ [C] $\log_b(64xy)$ [D] $\log_b\left(x^8 y^8\right)$

6. The number of bacteria present in a culture after t minutes is given as $B = 10e^{kt}$. If there are 8422 bacteria present after 9 minutes, find k.

   [A] 0.748 [B] 60.624 [C] 0.736 [D] 6.736

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7. Express in terms of logarithms of x, y, and z: $\log_a \frac{6xy^2}{z^5}$

[A] $\frac{\log_a 6 + \log_a x + 2\log_a y}{5\log_a z}$ [B] $6 + \log_a x + 2\log_a y - 5\log_a z$

[C] $\log_a 6 + \log_a x + 2\log_a y - 5\log_a z$ [D] $12 + \log_a xy - 5\log_a z$

8. Evaluate ln 96 correct to three decimal places and write the result in exponential form.

[A] $10^{4.563} = 96$ [B] $96^{4.564} = e$ [C] $e^{4.564} = 96$ [D] $e^{4.563} = 96$

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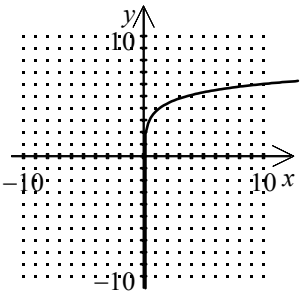
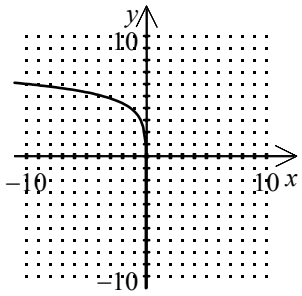
9. Graph: $f(x) = \left(\frac{1}{4}\right)^x$

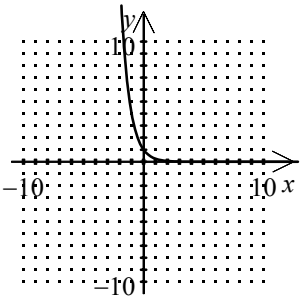
[A]



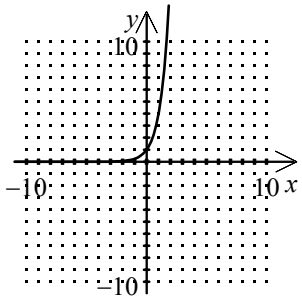
[B]



[C]



[D]



10. Express in terms of logarithms of x, y, and z: $\log_a \frac{7xy^5}{z^2}$

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Solve:

11. $6x^{-2} + x^{-1} + 1 = 0$

[A] no solution

[B] $x = -\frac{1}{3}, x = -\frac{1}{2}$

[C] $x = 3, x = -2$

[D] $x = 3, x = \frac{1}{2}$

12. $x^2 - 2x \geq 15$

[A] $-3 \leq x \leq 5$ [B] $x \leq -5$ or $x \geq 3$ [C] $x \leq -3$ or $x \geq 5$ [D] none of these

13. $2x^2 + 3x = 20$ [A] $\left\{-4, \frac{2}{5}\right\}$ [B] $\left\{4, -\frac{2}{5}\right\}$ [C] $\left\{4, -\frac{5}{2}\right\}$ [D] $\left\{-4, \frac{5}{2}\right\}$

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Solve:

14. $\sqrt{x+23} = x+11$

15. $(x + 2)(x - 6) < 0$

[A] $x < -2$ or $x > 6$

[B] $x < -6$ or $x > 2$

[C] $-2 < x < 6$

[D] $-6 < x < 2$

16. Solve the system:

$x^2 + y^2 = 144$

$x^2 - 4y^2 = 64$

[A] $(8\sqrt{2}, 4), (8\sqrt{2}, -4)$

[B] $(1, \sqrt{143}), (1, -\sqrt{143})$
$(-1, \sqrt{143}), (-1, -\sqrt{143})$

[C] $(-8\sqrt{2}, 4), (-8\sqrt{2}, -4)$

[D] $(8\sqrt{2}, 4), (8\sqrt{2}, -4)$
$(-8\sqrt{2}, 4), (-8\sqrt{2}, -4)$

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17. Solve the system: $x^2 + y^2 = 25$
$y = 3x - 3$

Solve:

18. $x^2 + y^2 = 16$
$x + y = 4$

[A] $\{(0, 4), (4, 0)\}$

[B] $\{(4, -4), (-4, -4)\}$

[C] $\{(0, 0), (4, -4)\}$

[D] $\{(0, -4), (-4, 0)\}$

19. $2x^2 - x - 10 = 0$

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20. 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.
$f(x) = x^6 - 2x^5 + 4x^4 - 5x^3 + 2x^2 - x + 3$

21. Use the Intermediate Value Theorem to determine which interval contains an x-intercept of the function.
$f(x) = 7x^5 + 3x^4 + 8x^3 - 2x^2 + x - 3$

[A] none of these [B] [0, 1] [C] [–4, –3] [D] [7, 8]

22. Locate the asymptotes and graph the rational function $f(x) = -\frac{4}{x^2 - 4}$.

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23. Use synthetic division to determine what pair of integers provide both a lower and an upper bound for the zeros of $f(x) = x^5 - 4x^4 - 20x^3 + 80x^2 + 64x - 258$.

24. Use the Intermediate Value Theorem to show that the graph of the function has an x-intercept in the given interval. Approximate the x-intercept correct to two places.
$f(x) = x^3 + x^2 - 8x - 11;\ [-3, -2]$

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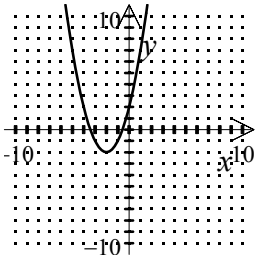
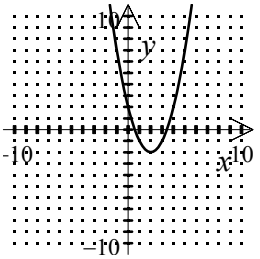
25. Graph: $f(x) = x^2 - 4x - 2$

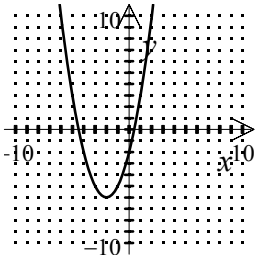
[A]



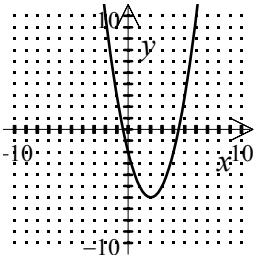
[B]



[C]



[D]



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[1] _____

[2] _____

[3] _____

[4] _____

[5] _____

[6] _____

[7] _____

[8] _____

[9] _____

[10] _____

[11] _____

[12] _____

[13] _____

[14] _____

[15] _____

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[16] _____

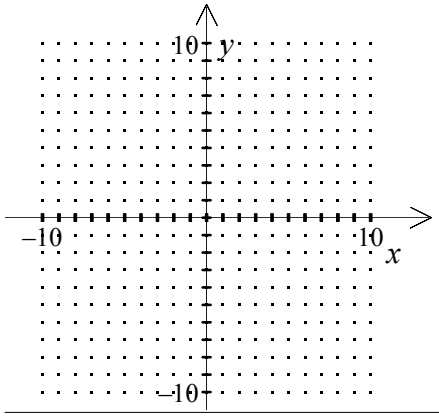
[17] _____

[18] _____

[19] _____

[20] _____

[21] _____



[22] _____

[23] _____

[24] _____

[25] _____

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[1] $\log_{11}(6xy + 30x + 24y + 120)$

---

[2] [A]

---

[3] $\frac{5}{9}$

---

[4] [C]

---

[5] [A]

---

[6] [A]

---

[7] [C]

---

[8] [C]

---

[9] [C]

---

[10] $\log_a 7 + \log_a x + 5\log_a y - 2\log_a z$

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[11] [A]

---

[12] [C]

---

[13] [D]

---

[14] -7

---

[15] [C]

---

[16] [D]

---

[17] $\left(\frac{9+\sqrt{241}}{10}, \frac{-3+3\sqrt{241}}{10}\right), \left(\frac{9-\sqrt{241}}{10}, \frac{-3-3\sqrt{241}}{10}\right)$

---

[18] [A]

---

[19] $\frac{5}{2}, -2$

---

[20] 6, 4, 2, or no positive real zeros; no negative real zeros

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[21] [B]

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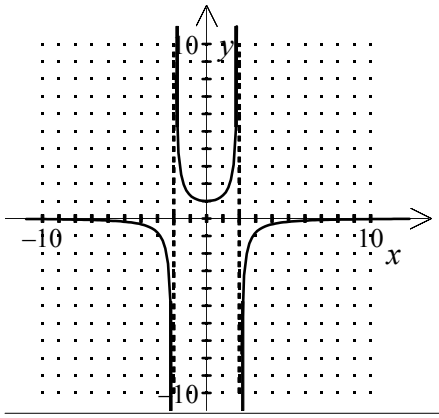
[22] 

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[23] –5, 7

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[24] $f(-3) = -5 < 0$ and $f(-2) = 1 > 0$. Since f is continuous, the graph of f must have an x-intercept in the interval $[-3, -2]$. The x-intercept is approximately –2.43.

---

[25] [D]