

Math 110 Exam 3: Winter 2010

4 Mar 2010 - 10 Mar 2010

1. Find the domain of the $f \circ g$ where $f(x) = \frac{x}{x+3}$ and $g(x) = \frac{2}{x}$.

- (a) $\{x|x \neq 0\}$
- (b) $\{x|x \neq -3, x \neq 0\}$
- (c) $\{x|x \neq 0, x \neq -2/3\}$
- (d) $\{x|x \neq 0, x \neq -3\}$
- (e) $\{x|x \neq -3, x \neq 0, x \neq -2/3\}$
- (f) $\{x|x \neq -\frac{2}{3}\}$

2. Find the inverse of $f(x) = \frac{4}{x+2}$.

- (a) $f^{-1}(x) = \frac{4}{x} - 2$
- (b) $f^{-1}(x) = \frac{4}{x} + 2$
- (c) $f^{-1}(x) = \frac{x+2}{4}$
- (d) $f^{-1}(x) = 2 - x$
- (e) $f^{-1}(x) = \frac{2}{x} - 4$
- (f) $f^{-1}(x) = x$

3. Find the domain of $h(x) = \log_3\left(\frac{x}{x-1}\right)$.

- (a) $(0, \infty)$
- (b) $(1, \infty)$
- (c) $(-\infty, 0)$
- (d) $[0, 1)$
- (e) $(-\infty, 0] \cup (1, \infty)$
- (f) $(-\infty, 0) \cup (1, \infty)$

4. Suppose that $\ln 7 = a$ and $\ln 2 = b$. Express $\ln\left(\frac{1}{14}\right)$ in terms of a and b .

- (a) $a + b$
- (b) $1 - a - b$
- (c) $1 - a + b$
- (d) $-(a + b)$
- (e) $1 - b$
- (f) $1 + a - b$

5. Solve $4^{3x} = 32$ for x .

- (a) $x = \frac{5}{6}$
- (b) $x = \frac{2}{3}$
- (c) $x = \frac{1}{2}$
- (d) $x = \frac{6}{5}$
- (e) $x = 2$
- (f) $x = \frac{3}{2}$

6. Which of the following is equivalent to $\log_5 9$:

- (a) $\log_5 36 - \log_5 3$ (d) $\log_5 1 + \log_5 18$
(b) $\log_5 45 - 1$ (e) $3 \log_5 3$
(c) $\log_5 1 + \log_5 3$ (f) $1 + \log_5 3$

7. Use properties of logarithms to find the exact value of $\log_6 9 + \log_6 4$.

- (a) 0 (d) 3
(b) 1 (e) 4
(c) 2 (f) none of the above

8. Express $21 \log_3 \sqrt[3]{x} + \log_3(9x^2) - \log_3 9$ as a single logarithm.

- (a) $\log_3(81x^9)$ (d) $\log_3\left(\frac{x^9+9x^2}{9}\right)$
(b) $21 \log_3(\sqrt[3]{x} + 9x^2 - 9)$ (e) $\log_3(9x)$
(c) $\log_3 x^9$ (f) none of the above

9. Solve $\log x + \log(x + 15) = 2$ for x . Recall that $\log x = \log_{10} x$.

- (a) $x = \frac{1500}{-99}$ (d) $x = -5$
(b) $x = -20$ and $x = 5$ (e) $x = 5$
(c) $x = -20$ (f) no solution exists

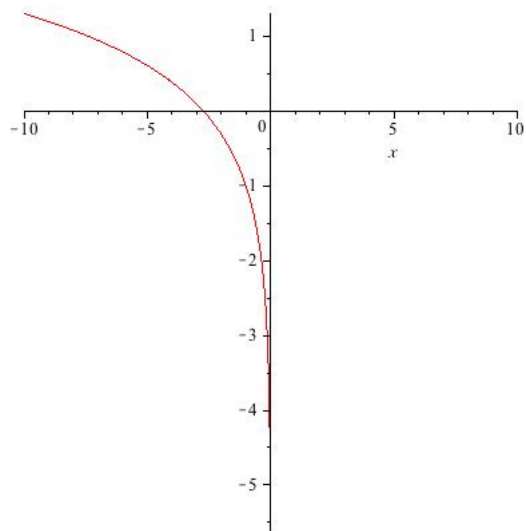
10. Solve $\log_2(x + 1) - \log_4 x = 1$ for x .

- (a) $x = -1$ (d) $x = 1$
(b) $x = 0$ (e) $x = 2$
(c) $x = \frac{1}{2}$ (f) no solution exists

11. Solve $2 \log_5 x = 3 \log_5 4$ for x .

- (a) $x = 16$ (d) $x = \pm 8$
(b) $x = \pm 16$ (e) $x = -8$
(c) $x = -16$ (f) $x = 8$

12. Select the function that best fits the following graph.



- | | |
|-----------------------|-----------------------|
| (a) $y = \ln(-x) - 1$ | (d) $y = -\ln(x) + 1$ |
| (b) $y = -\ln(x)$ | (e) $y = -\ln(x - 1)$ |
| (c) $y = \ln(-x - 1)$ | (f) $y = \ln(-x) + 2$ |

13. Solve $(\sqrt[3]{2})^{2-x} = 2^{x^2}$ for x

- | | |
|-------------------------------|------------------------------|
| (a) $x = -1, x = \frac{2}{3}$ | (d) $x = \frac{2}{3}$ |
| (b) $x = -1$ | (e) $x = 2$ |
| (c) $x = 2, x = \frac{1}{3}$ | (f) $x = 2, x = \frac{2}{3}$ |

14. The equation $3^{2x} - (4)3^x - 2 = -5$ has two solutions. Find the sum of the two solutions.

- | | |
|-------|-------|
| (a) 0 | (d) 3 |
| (b) 1 | (e) 4 |
| (c) 2 | (f) 5 |

15. How many years will it take for an initial investment of \$10,000 to grow to \$30,000? Assume a rate of interest of 10% compounded continuously.

- | | |
|-----------------|------------------------|
| (a) $\ln 3$ | (d) $10 \ln 3$ |
| (b) $100 \ln 3$ | (e) $-0.1 + \ln 5$ |
| (c) $\ln 5$ | (f) $\frac{\ln 3}{10}$ |

16. What is the principal needed to get 1000 dollars after 2 years at 6% interest compounded monthly?

- (a) $1000(1.005)^{24}$ (d) $1000(0.995)^{12}$
(b) $1000(1.005)^{-12}$ (e) $1000(0.995)^{-24}$
(c) $1000(1.005)^{-24}$ (f) $1000(1.005)^{12}$

17. A certain radioactive material decays according to the formula $A(t) = A_0e^{-0.0244t}$ where t is in years and A_0 is the initial amount of the material. What is the half life of this material?

- (a) $\frac{-\ln 2}{0.0244}$ (d) $\frac{\ln 2}{0.0244}$
(b) $\ln 2$ (e) $\frac{A_0 \ln 2}{0.0488}$
(c) $2(.0244)$ (f) none of the above

18. Find the vertex, focus, and directrix of the parabola $(y - 2)^2 = 8(x + 1)$.

- (a) vertex (2,-1); focus (2,1); directrix $x = 0$
(b) vertex (2,-1); focus (1,2); directrix $x = -3$
(c) vertex (2,-1); focus (4,-1); directrix $x = 0$
(d) vertex (-1,2); focus (1,2); directrix $x = 0$
(e) vertex (-1,2); focus (1,2); directrix $x = -3$
(f) vertex (-1,2); focus (-1,4); directrix $x = 4$

19. Write the equation of a parabola with the focus at (-3,4) and directrix at the line $y = 2$.

- (a) $(x - 3)^2 = 4(y + 3)$ (d) $(x - 3)^2 = -4(y + 3)$
(b) $(x + 3)^2 = 4(y - 3)$ (e) $(x + 3)^2 = 4(y + 3)$
(c) $(x + 3)^2 = -4(y - 3)$ (f) $(x - 3)^2 = -4(y - 3)$

20. Write the equation of a parabola that has vertex (0,0) and focus (4,0).

- (a) $x^2 = 16y$ (d) $x^2 = -16y$
(b) $y^2 = 8x$ (e) $x^2 = 8y$
(c) $y^2 = -8x$ (f) $y^2 = 16x$

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