

- What is the range of the function defined by the equation $y = x^2 + 4x$?
(a) $[-4, \infty)$ (b) $(-4, \infty)$ (c) $[-2, \infty)$ (d) $(-2, \infty)$ (e) $(-\infty, -4]$ (f) $(-\infty, -2)$
- If b and c are real numbers so that the polynomial $x^2 + bx + c$ has $2 + i$ as a zero, find $b + c$.
(a) -2 (b) -1 (c) 0 (d) 1 (e) 2 (f) 3
- Let $R(x) = \frac{3x^3 + x^2 + 3x + 3}{x^2 - x + 1}$. Find the oblique asymptote for $R(x)$.
(a) $y = 3x$ (b) $y = 3x + 1$ (c) $y = 3x + 2$ (d) $y = 3x + 3$ (e) $y = 3x + 4$ (f) $y = 3x + 5$
- Solve the inequality: $\frac{x^2 + x}{x - 2} \geq 0$
(a) $(-\infty, 0]$
(b) $[-1, 2)$
(c) $[-1, 0] \cup (2, \infty)$
(d) $(-\infty, -1] \cup \{0\} \cup (2, \infty)$
(e) $\{-1, 0\}$
(f) All real numbers.
- Solve the inequality: $\frac{2x + 1}{x + 1} + 1 < 0$.
(a) $(-\infty, -1) \cup (-2/3, \infty)$ (b) $(-1, -2/3)$ (c) $(2/3, 1)$ (d) $(-\infty, 2/3) \cup (1, \infty)$ (e) $(-1, -1/2)$
- Find the remainder when $x^{100} + 8x^{97} - 3x^2 - 5x$ is divided by $x + 2$.
(a) -3 (b) -2 (c) -1 (d) 1 (e) 2 (f) 3
- Find the product of the zeros of the polynomial $f(x) = 4x^3 - 16x^2 - x + 4$ given $x = 4$ is a zero.
(a) 1 (b) -1 (c) 2 (d) -2 (e) 3 (f) -3

8. Given $x = 1 + i$ is a solution to $x^4 - 4x^3 + 2x^2 + 4x - 8 = 0$. The real solutions to this equation are $x = 1 \pm \sqrt{b}$ where $b =$

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

9. Find the domain of the function $f(x) = \ln\left(x - \frac{1}{x}\right)$.

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

10. Consider the function $f(x) = \frac{x+4}{x+2}$. If g is the inverse function to f , then $g(2) =$

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

11. If x is the solution to $8^{2x} = 4^{x+5}$, then x is between

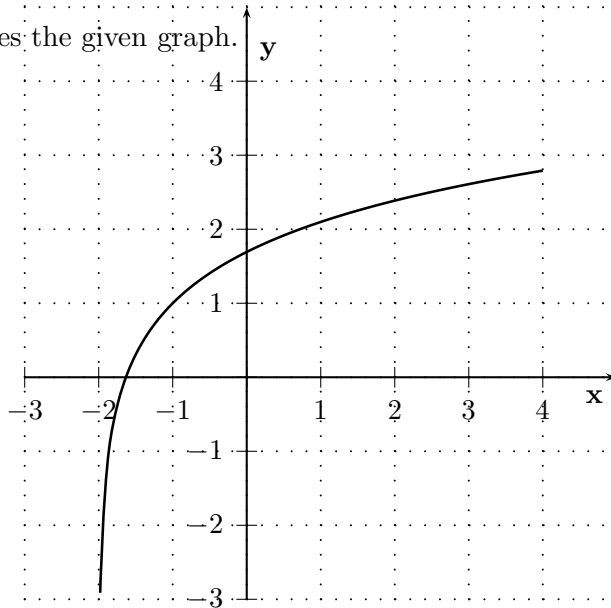
- (a) 0 and 1 (b) 1 and 2 (c) 2 and 3 (d) 3 and 4 (e) 4 and 5 (f) 5 and 6

12. Find $\log_2\left(\frac{8}{\sqrt{2}}\right)$.

- (a) 1/2 (b) 3/2 (c) 5/2 (d) 7/2 (e) 9/2 (f) 11/2

13. Select the function that best describes the given graph.

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



14. $\log_4 300$ is between

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

15. Use properties of logarithms to find the exact value of the expression

$$\log_2 3 \cdot \log_3 16 \cdot \log_5 7 \cdot \log_7 5$$

- (a) 1 (b) 2 (c) 4 (d) 8 (e) 16 (f) 32

16. Recall that “log” means logarithm base 10. If $a = \log 2$ and $b = \log 3$ write $\log(5/6)$ in terms of a and b .

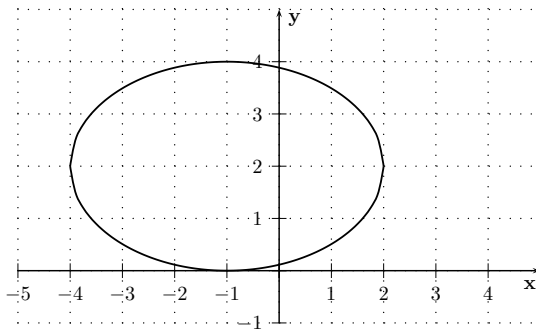
- (a) $1 + 2a + b$ (b) $1 + 2a - b$ (c) $1 - 2a + b$ (d) $1 - a - b$ (e) $1 - a - 2b$ (f) $1 - 2a - b$

17. Use natural logarithms to solve the equation $3^x = \frac{1}{\sqrt{e}}$. Then x equals

- (a) $-\frac{1}{2 \ln 3}$ (b) $\frac{1}{2 \ln 3}$ (c) $-\frac{1}{3 \ln 2}$ (d) $\frac{1}{3 \ln 2}$ (e) $\ln 3$ (f) $-\frac{\ln 3}{2}$

18. Find the foci for the given ellipse.

- (a) $(-1 - \sqrt{3}, 2)$ and $(-1 + \sqrt{3}, 2)$
(b) $(-1 - \sqrt{5}, 2)$ and $(-1 + \sqrt{5}, 2)$
(c) $(-1 - \sqrt{7}, 2)$ and $(-1 + \sqrt{7}, 2)$
(d) $(-2, 2)$ and $(0, 2)$



19. Which of the following conics is represented by the equation $x^2 - y^2 + 4x - 2y = x^2 + 2y + 2$?

- (a) Circle (b) Ellipse (c) Parablola (d) Hyperbola (e) None of these

20. Find the asymptotes of the hyperbola $36(x + 3)^2 - 9(y - 2)^2 = 36$.

- (a) $y + 2 = \pm 4(x + 3)$ (b) $y - 2 = \pm 4(x + 3)$ (c) $y + 2 = \pm 2(x + 3)$ (d) $y - 2 = \pm 2(x + 3)$

21. Solve the system of equations for x .

$$\begin{array}{rclcrcl} 2x & +y & +z & = & 10 \\ x & +2y & +z & = & 6 \\ x & +y & +2z & = & 12 \end{array}$$

- (a) $x = 1$ (b) $x = 2$ (c) $x = 3$ (d) $x = 4$ (e) $x = 5$

22. If $\frac{5x-2}{x^2-4} = \frac{A}{x+2} + \frac{B}{(x-2)}$, then
- (a) $A+B=1$ (b) $A+B=2$ (c) $A+B=3$ (d) $A+B=4$ (e) $A+B=5$
23. Find the infinite geometric sum $8 - 4 + 2 - 1 + \dots$.
- (a) 16 (b) $\frac{16}{3}$ (c) 8 (d) $\frac{8}{3}$ (e) 4 (f) $\frac{4}{3}$
24. Find the arithmetic sum $5 + 13 + \dots + (8n - 3)$.
- (a) $4n^2 + n$ (b) $4n^2 - n$ (c) $n^2 + 4n$ (d) $n^2 - 4n$ (e) $8n^2 + 2n$
25. Find the coefficient of x^{99} in $(x - 1)^{101}$.
- (a) 1 (b) -1 (c) 5050 (d) -5050 (e) 4950 (f) -4950
26. Find the constant term in the expansion of $\left(x^2 - \frac{1}{x^3}\right)^5$.
- (a) -5 (b) 5 (c) -10 (d) 10 (e) -20 (f) 20
27. A coed soccer team has 9 girls and 9 boys. How many ways can you choose a team of 5 girls and 6 boys?
- (a) less than 500
 (b) between 500 and 1,000
 (c) between 1,000 and 5,000
 (d) between 5,000 and 10,000
 (e) over 10,000
28. How many different words (with or without meaning) can be made by rearranging the letters in the word *knickknack*.
- (a) less than 10^3 (b) between 10^3 and 10^4 (c) between 10^4 and 10^5 (d) more than 10^5
29. Determine the probability of tossing 2 heads and 3 tails with a fair coin.
- (a) $\frac{1}{2}$ (b) $\frac{1}{4}$ (c) $\frac{3}{8}$ (d) $\frac{5}{16}$ (e) $\frac{7}{16}$
30. Four people randomly choose one of eight flavors of ice cream. The probability that at least two of them choose the same flavor is closest to
- (a) 0.2 (b) 0.3 (c) 0.4 (d) 0.5 (e) 0.6 (f) 0.7

1. a
2. d
3. e
4. c
5. b
6. b
7. b
8. f
9. a
10. a
11. c
12. c
13. e
14. e
15. c
16. f
17. a
18. b
19. c
20. d
21. c
22. e
23. b
24. a
25. c
26. d
27. e
28. c
29. d
30. e