

A calculator may be used as needed.

1. Find all of the real roots. $x^3 + 5x^2 + 4x - 4 = 0$
- a. -2 b. $2, \frac{-3 \pm \sqrt{17}}{2}$ c. 2 d. $-2, \frac{-3 \pm \sqrt{17}}{2}$
- e. none of these
2. Solve using the method of your choice.
- $$y = 2x^2 - 1$$
- $$y = 3 - 2x^2$$
- a. $(0, -1) (0, -3)$ b. $(\frac{1}{\sqrt{2}}, 0) (-\frac{1}{\sqrt{2}}, 0)$ c. $(1, 0) (-1, 0)$
- d. $(1, 1) (-1, 1)$ e. none of these
3. Find the inverse of the function: $f(x) = \frac{3+8x}{9}$
- a. $y = \frac{3-8x}{9}$ b. $y = \frac{9}{3+8x}$ c. $y = \frac{9x-3}{8}$
- d. $y = \frac{3-9x}{8}$ e. none of these
4. Use synthetic division to express $\frac{x^3 - 6x^2 - 3x + 1}{x - 2}$ as a quotient with a fractional remainder.
- a. $x^2 - 4x - 11 - \frac{21}{x-2}$ b. $x^2 - 8x + 13 - \frac{25}{x-2}$
- c. $x^2 - 4x + 5 - \frac{9}{x-2}$ d. $x^2 - 8x + 13 - \frac{27}{x-2}$
- e. none of these

5. Use the method of back substitution to find the value of x for the solution of the system of equations.

$$2x + y - z = 24$$

$$3y + z = -14$$

$$z = -8$$

- a. 15 b. 9 c. 17 d. -2 e. none of these

6. Solve: $4^{3x} = 8^{4x-5}$

- a. $2/5$ b. $-2/5$ c. $5/2$ d. $-5/2$ e. none of these

7. Evaluate: $e^{\ln 9}$

- a. e^{-9} b. 9 c. -9 d. $\frac{1}{9}$ e. none of these

8. Evaluate

$$\log_{15} 7$$

- a. 1.3917 b. 0.7747 c. 0.9939 d. 0.7186
e. none of these

9. Write as the logarithm of a single quantity: $2\log x - \frac{1}{2}\log z$

- a. $\log(x^2 - \sqrt{z})$ b. $\log\left(\frac{x}{z}\right)$ c. $\log\frac{x^2}{\sqrt{z}}$
d. $\log\left(\frac{4x}{z}\right)$ e. none of these

10. Solve for x . $6^{3x} = 216$

- a. 3 b. 36 c. 1 d. 12 e. none of these

11. Solve for x . $\log_2 3x = 3$

- a. $\frac{8}{3}$ b. $3, \frac{-8}{3}$ c. 1 d. -1 e. none of these

12. Find the domain of the function. $f(x) = \sqrt{(3x+1)}$

- a. $(-\infty, \infty)$ b. $(-\frac{1}{3}, \infty)$ c. $(0, \infty)$ d. $(\frac{1}{3}, \infty)$

e. none of these

13. Give the determinant of:

$$\begin{bmatrix} 3 & 2 \\ -4 & 5 \end{bmatrix}$$

- a. 7 b. 23 c. -7 d. -23

e. none of these

14. Determine the dimension of the matrix.

$$\begin{bmatrix} 2 & 4 & -5 \\ 0 & 7 & -2 \end{bmatrix}$$

- a. 6 b. 2×3 c. 5 d. 3×2 e. none of these

15. Find the horizontal asymptote. $y = \frac{-2x}{x+7}$

- a. $y = 2$ b. $x = -7$ c. $y = -2$ d. $y = -\frac{2}{7}$

e. none of these

16. Find the vertical asymptote(s). $y = \frac{5x^2}{x^2 - 25}$

- a. $x = 25$ b. $x = -5, x = 5$ c. $x = 0$ d. $y = 5$

e. none of these

17. Use synthetic division to divide: $\frac{x^3 + 8}{x + 2}$

- a. $x^2 + 4$ b. $x^2 + 2x + 4$ c. $x^2 - 4x + 4$

d. $x^2 - 2x + 4$ e. none of these

18. Use synthetic division to evaluate $f(3)$ if $f(x) = 2x^3 - 7x^2 + 5x + 1$.

- a. -5 b. 6 c. 7 d. 5 e. none of these

19. If $A = \begin{bmatrix} 3 & 4 \\ 1 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 \\ 2 & 4 \end{bmatrix}$ then $A - 2B$ equals

- a. $\begin{bmatrix} -1 & -1 \\ -1 & 3 \end{bmatrix}$ b. $\begin{bmatrix} 18 & 25 \\ 16 & 31 \end{bmatrix}$ c. $\begin{bmatrix} -1 & -2 \\ -3 & -1 \end{bmatrix}$
d. $\begin{bmatrix} 12 & 13 \\ 22 & 24 \end{bmatrix}$ e. none of these

20. If Cramer's Rule were used to solve this system of equations, find the value of D_x .

$$\begin{aligned}x - 4y - z &= -24 \\x + 3y - 3z &= 0 \\2x - 7y - 4z &= -48\end{aligned}$$

- a. 72 b. 60 c. -48 d. 6 e. none of these

21. Find the distance between the points $(-2, 7)$ and $(3, 19)$.

- a. 13 b. 169 c. $\sqrt{145}$ d. $\sqrt{143}$
e. none of these

22. If $f(x) = 4x - 3$ and $g(x) = x^2 - 4$, find $(f \circ g)(x)$.

- a. $x^2 - 1$ b. $4x^2 - 19$ c. $4x - 13$
d. $4x - 1$ e. none of these

23. Find the domain of $f(x) = \log(x^2 - 4x + 3)$

- a. $(-\infty, -1) \cup (3, \infty)$ b. $(-1, 3)$ c. $(-\infty, -1) \cup (-3, \infty)$
d. $(-1, -3)$ e. none of these

24. What is the center of the ellipse whose equation is $\frac{(x-3)^2}{4} + \frac{(y+7)^2}{9} = 1$

- a. (3,7) b. (-3,7) c. (-3,-7)
d.(3,-7) e. none of these

25. Express the equation of the circle in standard form $(x-h)^2 + (y-k)^2 = r^2$.
 $x^2 + y^2 - 10x + 8y + 32 = 0$

- a. $(x+5)^2 + (y-4)^2 = 9$ b. $(x+5)^2 + (y-4)^2 = 3$
c. $(x-5)^2 + (y+4)^2 = 9$ d. $(x-5)^2 + (y+4)^2 = 3$
e. none of these

26. Which of the following statements are **true** of the graph of the equation
 $y = x^2 - 2x - 15$?

- i. It has x-intercepts at -3 and 5.
ii. It has y - intercept at -15.
iii. It has vertex at (1, -16).
iv. It has a horizontal asymptote at $y = -16$.
- a. All of the statements are true b. Statements i, ii, and iv only
c. Statements ii, iii and iv only d. Statements i, ii and iii only
e. none of these

27. The graph of $y = (x-4)^3$ is obtained by shifting the graph of $y = x^3$

- a. 4 units down b. 4 units up c. 4 units right d. 4 units left
e. none of these

28. Write the equation of a line which passes through (-3,7) and is parallel to the x-axis.

- a. $y = -3x + 7$ b. $y = -3$ c. $y = 7$ d. $x = -3$ e. none of these

29. If $f(x) = x^2 - 6x + 7$, find $f(-3)$.

- a. 34 b. 22 c. 16 d. -1 e. none of these

30. A small manufacturing firm collected the following data on advertising expenditures x (in thousands of dollars) and total revenue y (in thousands of dollars).

Advertising	Total Revenue
20	39
22	43
23	45
25	50
27	55
28	57
29	59
31	64

Find the **linear regression** which best fits the data - using the numbers as they are given in the chart. (Disregard the fact that they represent thousands of dollars.)

- a. $y = 7.3830x + 2.2979$ b. $y = 2.2979x - 7.3830$
c. $y = -7.3830x + 2.2979$ d. $y = -2.2979x + 7.3830$
e. none of these

31. If $4i$ is a root of the function $f(x) = x^3 + 2x^2 + 16x + 32$ then what are the other two roots?

- a. 2 and -2 b. 2 and $-4i$ c. -2 and $-4i$
d. -2 and $4i$ e. none of these

32. Which of the following represents a hyperbola with ends of the transverse axis at $(\pm 2, 0)$?

- a. $\frac{x^2}{1} - \frac{y^2}{4} = 1$ b. $\frac{x^2}{4} - \frac{y^2}{1} = 1$ c. $\frac{x^2}{1} + \frac{y^2}{4} = 1$ d. $\frac{x^2}{4} + \frac{y^2}{1} = 1$
e. none of these

33. Which of the following represents a parabola with a horizontal directrix and with focus at $(0, -1)$?

- a. $x^2 = 4y$ b. $x^2 = -4y$ c. $y^2 = 4x$ d. $y^2 = -4x$ e. none of these

34. Multiply: $(2i - 5)(3i + 1)$

- a. $6i^2 - 5$ b. $-11 - 17i$ c. $-11 - 13i$
d. $1 - 13i$ e. none of these

35. What is the end behavior of the graph of the function

$$f(x) = (x - 3)(x + 1)^2(x + 5)$$

- a. Up on the left and down on the right
b. Up on the left and up on the right
c. Down on the left and down on the right
d. Down on the left and up on the right
e. None of these

36. Give the domain of the function: $f(x) = e^x + 1$

- a. $(-\infty, \infty)$ b. $(-1, \infty)$ c. $(-\infty, 1)$
d. $(1, \infty)$ e. none of these

37. Which of the following statements is true of the graph of the function

$$f(x) = \log(x - 2)$$

- a. It has domain $(-\infty, \infty)$
b. It has a vertical asymptote at $x=2$
c. It has a horizontal asymptote at $y=2$.
d. It has x intercept $(0, -2)$
e. None of these

38. If the perimeter of a rectangle is 31, write the area of the rectangle in terms of the width.

- a. $A = \frac{31-2w}{2}$ b. $A = (w)\left(\frac{31-2w}{2}\right)$ c. $A=(L)(w)$
d. $A = (w)(31-2w)$ e. none of these

39. Evaluate $\log_3(27\sqrt{3})$

- a. 15 b. $1/2$ c. 3 d. $7/2$
e. none of these

40. What is the slope of a line that is perpendicular to $3x - 7y = 55$

- a. $3/7$ b. $7/3$ c. $-3/7$ d. $-7/3$
e. none of these

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49	A	B	C	D	E
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