

Functions

1. If $f(x) = 3x^2 - 2x + 4$, find $f(-2)$.
2. If $f(x) = 3x - 2$ and $g(x) = x^2 - 4x + 1$, find:
 - a. $(f + g)(x)$
 - b. $(f - g)(x)$
 - c. $(fg)(x)$
 - d. $\left(\frac{f}{g}\right)(x)$
 - e. $(f \circ g)(x)$
 - f. $(g \circ f)(x)$
 - g. $f(g(2))$
3. If $f(x) = 2x - 3$, find $f^{-1}(x)$.
4. If $f(x) = \sqrt[3]{4x + 1}$, find $f^{-1}(x)$.
5. If $f(x)$ contains the point $(4, 1)$, then $f^{-1}(x)$ must contain what point?
6. Find the domain of each function:
 - a. $f(x) = x^2 - 7x + 4$
 - b. $f(x) = \frac{7}{4x - 9}$
 - c. $f(x) = \frac{x - 1}{x^2 - 2x - 8}$
 - d. $f(x) = \sqrt{3x + 7} - 1$
7. If $\frac{(2x^2 + kx + 3)}{(x - 3)} = 2x - 1$, then find the value of k .
8. If $x = 4y + 1$ and $z = 3x - 5$, find an expression for z in terms of y .
9. Find the vertex of the function, $f(x) = 3x^2 + 6x - 5$.
10. What are the roots of the function, $f(x) = 2x^2 - 8x + 3$?
11. Find the zeros of the function, $f(x) = 3x^2 + 11x - 4$.
12. What are the roots of the function, $f(x) = x^3 + 2x^2 - 9x - 18$?
13. Find the sum of the solutions of $2x^2 = 5x + 4$.
14. Write a cubic function that has $x = 0$, $x = -2$, and $x = 5$ as zeros.
15. Write a quadratic function that has a vertex at $(2, -3)$ and contains the point $(-2, 5)$.

Exponents

Simplify:

1. $(a^2)^{\frac{2}{3}}$

2. $ab^{\frac{1}{2}} \cdot a^{\frac{2}{3}}b$

3. $\frac{3a^2b^6}{6ab^8}$

4. $\frac{a^{\frac{3}{5}}}{a^{\frac{1}{2}}}$

5. $(3xy^{-2})^{-3}$

6. $\frac{(4x^2)^3}{x^{-7}}$

7. $3a^{\frac{1}{2}}b^{\frac{3}{2}} \cdot 2a^{\frac{3}{2}}b^{\frac{5}{2}}$

8. $\left(\frac{2x^2y^{-5}}{3x^{-3}y^6}\right)^{-3}$

Evaluate:

9. $8^{\frac{1}{6}} \cdot 8^{\frac{1}{2}}$

10. $3^{\frac{1}{3}} \cdot 3^{\frac{2}{3}}$

Simplify. Assume all variables represent positive numbers.

11. $\sqrt{a} \cdot \sqrt[3]{a^2}$

12. $\sqrt[3]{a} \cdot \sqrt[5]{b}$

13. $\sqrt[3]{a} \cdot \sqrt[3]{a^2}$

14. $\sqrt{2a^2b} \cdot \sqrt{8a^4b}$

15. $\sqrt[4]{4a^2b^5} \cdot \sqrt[4]{4a^5b^3}$

16. $\sqrt[3]{x} \cdot \sqrt[4]{x}$

17. Rewrite using logarithmic notation.

a. $4^2 = 16$

b. $x^2 = 5$

c. $M^x = y$

18. Rewrite using exponential notation.

a. $\log_{10} 100 = 2$

b. $\log_3\left(\frac{1}{3}\right) = -1$

c. $\log_x R = y$

19. Evaluate: $\log_2\left(\frac{1}{4}\right)$

Express in terms of logarithms:

20. $\log_a \frac{x^2y}{\sqrt[3]{z}}$

21. $\log_2 \sqrt{\frac{a^6b^4}{z}}$

Express as a single logarithm.

22. $\frac{1}{2}\log_b x - \log_b y - \log_b z$

23. $\frac{1}{3}\log_b x - \frac{2}{3}\log_b y$

24. $2\log_{10} 3 + 4\log_{10} y - 6\log_{10} z - 8\log_{10} t$

Complex Numbers

1. Simplify the following to i , $-i$, 1 or -1 .

a. i^2

b. i^8

c. i^{42}

d. i^{103}

e. i^{218}

f. i^{1001}

2. Add the following and write your answer in $a+bi$ form.

a. $(2-3i) + (5+6i)$

b. $(7-i) + (3-4i)$

c. $(1+i) + (3+5i)$

d. $(8+9i) + (11-13i)$

3. Subtract the following and write your answers in $a+bi$ form.

a. $(2-3i) - (5+6i)$

b. $(3-4i) - (7-i)$

c. $(3+i) - (1+5i)$

d. $(13+8i) - (9-11i)$

4. Multiply the following and write your answer in $a + bi$ form.

- a. $3i \cdot 4$ b. $2i \cdot 5i$ c. $7i(2 - 5i)$ d. $2i(1 + i)$
e. $(1 + 2i)(3 + 4i)$ f. $(2 - 3i)(-1 + i)$ g. $(1 - i)(-1 + i)$
h. $(2 - i)^3$

5. Divide the following and write your answers in $a + bi$ form.

- a. $\frac{2}{3i}$ b. $\frac{2}{i}$ c. $\frac{1}{1+i}$ d. $\frac{6}{2-3i}$ e. $\frac{1+i}{1-i}$ f. $\frac{3-5i}{4+3i}$

6. Solve the following for x over the complex number system:

- a. $x^2 + 25 = 0$ b. $x^2 + 10 = 3x$ c. $x^2 = 2x - 4$ d. $x^2 = -12$

Miscellaneous Problems

- Write the first five terms of the sequence having the general term $a_n = (-1)^{n+1} \frac{n+1}{n^2}$.
- A certain arithmetic sequence has $a_1 = 56$ and $a_{11} = 26$. Find a_{17} .
- A certain geometric sequence has $a_1 = 64$ and $a_5 = 324$. Find a_7 .
- Find the sum of the first ten terms of an arithmetic sequence having $a_1 = 27$ and $d = 9$.
- Find the sum of the first ten terms of a geometric sequence having $a_1 = 3072$ and $r = \frac{3}{2}$.
- Evaluate $\sum_{n=1}^{23} (6n - 3)$.
- Evaluate $\sum_{n=1}^4 8 \left(\frac{1}{2}\right)^{n-1}$.
- Evaluate $\sum_{n=0}^{\infty} \frac{500}{3} \left(\frac{3}{5}\right)^n$.
- Evaluate $4!$.
- Evaluate $\frac{9!}{3!}$.
- Evaluate $\frac{16!}{4! 12!}$.
- Give the entry in the first row and the first column for $\begin{bmatrix} 8 & -2 \\ 3 & 7 \\ -5 & 0 \end{bmatrix} + 5 \begin{bmatrix} -3 & 4 \\ 0 & 3 \\ -2 & 6 \end{bmatrix}$.
- Give the entry in the second row and the first column for $\begin{bmatrix} 3 & 4 \\ -2 & 5 \\ 0 & 3 \end{bmatrix} \begin{bmatrix} 2 & 3 \\ 5 & 6 \end{bmatrix}$.
- Evaluate $\begin{vmatrix} 12 & -9 \\ -3 & 5 \end{vmatrix}$.

15. Evaluate $\begin{vmatrix} -3 & 1 & 2 \\ -5 & 6 & 0 \\ -2 & 3 & -1 \end{vmatrix}$

16. Give the z -value of the solution to the following system: $4x - 5y = 11$
 $2x + z = 7$
 $2y + z = 1$

17. If $S = \frac{a}{1-r}$, then $r = ?$

18. If $\begin{bmatrix} 2 & 3 \\ 5 & 6 \end{bmatrix} \begin{bmatrix} k & 1 \\ 0 & 2 \end{bmatrix} = \begin{bmatrix} 4 & 8 \\ 10 & 17 \end{bmatrix}$, then $k = ?$

19. If \oplus is defined to be: $x \oplus y = x^y - 1$ and $x \oplus 5 = 31$, then $x = ?$

20. If $\begin{vmatrix} k & 1 \\ 0 & 2 \end{vmatrix} = 10$, then $k = ?$

21. In the list $-\frac{1}{2}, \sqrt{7}, \sqrt{25}, \pi, \frac{0}{8}, 16.2, \frac{3}{5}, 12$, the sum of all the rational numbers is:

22. How many integers are in the list: $-\frac{1}{2}, \sqrt{7}, \sqrt{25}, \pi, \frac{0}{8}, 16.2, \frac{3}{5}, 12$?

23. Find the fourth term in the expansion of $(3y - z)^7$.

24. How many terms are in the expansion of $(3y - z)^7$?

25. A set containing five elements has how many subsets?

Answers to College Algebra COMPASS Review

Functions

1. 20

2a. $x^2 - x - 1$

2b. $-x^2 + 7x - 3$

2c. $3x^3 - 14x^2 + 11x - 2$

2d. $\frac{3x - 2}{x^2 - 4x + 1}$

2e. $3x^2 - 12x + 1$

2f. $9x^2 - 24x + 13$

2g. -11

3. $f^{-1}(x) = \frac{x + 3}{2}$

4. $f^{-1}(x) = \frac{x^3 - 1}{4}$

5. (1,4)

6a. $(-\infty, \infty)$

6b. $\left(-\infty, \frac{9}{4}\right) \cup \left(\frac{9}{4}, \infty\right)$

6c. $(-\infty, -2) \cup (-2, 4) \cup (4, \infty)$

6d. $\left[-\frac{7}{3}, \infty\right)$

7. $k = -7$

8. $z = 12y - 2$

9. (-1, -8)

10. $x = \frac{4 \pm \sqrt{10}}{2}$

11. $x = \frac{1}{3}, x = -4$

12. $x = 3, x = -3, x = -2$

13. $\frac{5}{2}$

14. $f(x) = x^3 - 3x^2 - 10x$

15. $f(x) = \frac{1}{2}x^2 - 2x - 1$

Exponents

1. $a^{\frac{4}{3}}$

2. $a^{\frac{5}{3}}b^{\frac{3}{2}}$

3. $\frac{a}{2b^2}$

4. $a^{\frac{1}{10}}$

5. $\frac{y^6}{27x^3}$

6. $64x^{13}$

7. $6a^2b^4$

8. $\frac{27y^{33}}{8x^{15}}$

9. 4

10. 3

11. $a^{\sqrt[6]{a}}$

12. $\sqrt[15]{a^5b^3}$

13. a

14. $4a^3b$

15. $2ab^2\sqrt[4]{a^3}$

16. $\sqrt[12]{x^7}$

17a. $\log_4 16 = 2$

17b. $\log_x 5 = 2$

17c. $\log_M y = x$

18a. $10^2 = 100$

18b. $3^{-1} = \frac{1}{3}$

18c. $x^y = R$

19. -2

20. $2\log_a x + \log_a y - \frac{1}{3}\log_a z$

21. $3\log_2 a + 2\log_2 b - \frac{1}{2}\log_2 z$

22. $\log_b \frac{\sqrt{x}}{yz}$

23. $\log_b \sqrt[3]{\frac{x}{y^2}}$

24. $\log_{10} \left(\frac{9y^4}{z^6t^8} \right)$

Complex Numbers

1a. -1

1b. 1

1c. -1

1d. $-i$

1e. -1

1f. i

2a. $7 + 3i$

2b. $10 - 5i$

2c. $4 + 6i$

2d. $19 - 4i$

3a. $-3 - 9i$

3b. $-4 - 3i$

3c. $2 - 4i$

3d. $4 + 19i$

4a. $0 + 12i$

4b. $-10 + 0i$

4c. $35 + 14i$

4d. $-2 + 2i$

4e. $-5 + 10i$

4f. $1 + 5i$

4g. $0 + 2i$

4h. $2 - 11i$

5a. $0 - \frac{2}{3}i$

5b. $0 - 2i$

5c. $\frac{1}{2} - \frac{1}{2}i$

5d. $\frac{12}{13} + \frac{18}{13}i$

5e. $0 + i$

5f. $-\frac{3}{25} - \frac{29}{25}i$

6a. $x = \pm 5i$

6b. $x = \frac{3}{2} \pm \frac{\sqrt{31}}{2}i$

6c. $x = 1 \pm i\sqrt{3}$

6d. $x = \pm 2i\sqrt{3}$

Miscellaneous Problems

1. $2, -\frac{3}{4}, \frac{4}{9}, -\frac{5}{16}, \frac{6}{25}$

2. -8

3. 729

4. 675

5. $348,150$

6. 1587

7. 15

8. $\frac{1250}{3}$ or $416\frac{2}{3}$

9. 24

10. $60,480$

11. $1,820$

12. -7

13. 21

14. -33

15. 7

16. -1

17. $r = \frac{S - a}{S}$

18. 2

19. 2

20. 5

21. 33.3

22. 3

23. $-2835y^4z^3$

24. 8

25. 32