

Math 51 – Final Exam Review Exercises

Note: Two or three of these problems will be on the final exam. It is important to understand that these review exercises are not guaranteed to cover all of the potential problems on the final exam. Please review the notes, practice problems, tests, and homework problems to fully prepare for the final exam. Now, take a deep breath, and get to it! ☺

1. Solve the following equations.

- a. $5(2x + 3) - 4x = 2x + 25$
- b. $\frac{1}{4}(3x - 1) + \frac{1}{6}(x + 3) = 3$
- c. $8(x - 3) + 4x = 6(2x + 1) - 10$
- d. $4(x + 3) = 2(2x + 8) - 4$
- e. $\frac{3x-2}{5} = \frac{4-x}{3}$

2. Find the value of the variable that is not given.

- a. $A = \frac{1}{2}h(b + B)$, $A = 75$, $b = 19$, $B = 31$
- b. $C = 2\pi r$, $C = 100\pi$

3. Solve each formula for the specified variable.

- a. $V = \pi r^2 h$ for h
- b. $P = 2L + 2W$ for W
- c. $\frac{1}{x} = \frac{1}{y} - \frac{1}{z}$ for y
- d. $I = \frac{E}{R+r}$ for r

4. Solve the following inequalities, and graph each solution set. Write your answers in interval notation.

- a. $2x - 3(x - 6) < 4(x + 7)$
- b. $2(x - 5) + 3x \leq 4(x - 6) + 1$
- c. $2 < 6 + \frac{3}{4}x \leq 12$

5. Graph the following linear equations. Also, find each slope and y-intercept (if any).

- a. $y = 4x + 3$
- b. $-3x + y = -6$
- c. $x - 4 = 0$
- d. $-3y = 15$

6. Write an equation of the line satisfying the given conditions. Give the final answer in slope-intercept form.

- a. passes through $(-4,5)$ and $(-5,8)$
- b. parallel to $5x - y = 10$ with y-intercept $(0, -2)$
- c. through $(4,2)$ and perpendicular to $4x - y = -2$
- d. passes through $(-2,2)$ and has slope $\frac{3}{2}$

- e. vertical line passing through $(3, -5)$
- f. horizontal line passing through $(3, -5)$

7. Graph the following linear inequalities.

- a. $3x + 4y < 12$
- b. $y < -3x + 1$
- c. $x > 1$

8. Solve the following systems of equations.

- a.
$$\begin{cases} 5x + 2y = -15 \\ 2x - y = -6 \end{cases}$$
- b.
$$\begin{cases} 2x + 10y = 3 \\ x = 1 - 5y \end{cases}$$
- c.
$$\begin{cases} \frac{1}{3}x + \frac{1}{2}y = \frac{13}{6} \\ \frac{1}{2}x - \frac{1}{4}y = -\frac{3}{4} \end{cases}$$

9. Simplify.

- a. $\left(\frac{6x^3y^9}{z^5}\right)^4$
- b. $(3x^4y^2z)^3(yz^4)^5$
- c. $\frac{(x^{-1}y^2z)^{-2}}{(x^{-3}y^3z)^{-1}}$
- d. $\left(\frac{xy^{-2}}{x^2y}\right)^{-3}$
- e. $\frac{(x^{-4}y^2)^3(x^2y)^{-1}}{(xy^2)^{-2}}$

10. Perform the indicated operation.

- a. $(-2x^6 + 3x^4 - x^2) + (x^6 + 2x^4 + 2x^2 - 3)$
- b. $(x^2 + x) - (3x^2 + x - 1)$

11. Find each product.

- a. $-7x(3 + 5x^2 - 2x^3)$
- b. $(2x + 8)(3x^5 - 2x^2 + 1)$
- c. $-4x(3x + 2)(2x - 5)$
- d. $(3x - 1)^2$
- e. $(5x + 3)^2$

12. Perform each division.

- a. $\frac{18x^5 + 12x^3 - 6x^2}{-6x^3}$
- b. $\frac{12x^3 - 11x^2 + 9x + 18}{4x + 3}$
- c. $(2x^3 + x + 2) \div (x + 1)$

d. $\frac{3x^4+5x^3-8x^2-13x+2}{x^2-5}$

13. Factor completely (or write prime if not factorable over the integers).

a. $x^2 + 17x + 72$

b. $8x^2 - 10x - 3$

c. $x^2 - xy + y^2$

d. $64x^2 - 100y^2$

e. $8x^3 + 125$

f. $4 - 2x - 6y + 3xy$

g. $16x^2 - 48x + 36$

h. $16x^2 + 24xy + 9y^2$

i. $x^2 + 9$

j. $12x^3 - 2x^2y - 24xy^2$

k. $6x^3 - 6x$

14. Solve.

a. $x^2 - 2x = 3$

b. $x(3x - 20) = -12$

c. $x^3 = 6x^2 - 8x$

15. Simplify.

a. $\frac{3x^2+8x+4}{3x^2-4x-4}$

b. $\frac{x-3}{x^3-27}$

c. $\frac{x^2-9}{x^3+27}$

d. $\frac{y-x}{x^2-y^2}$

e. $\frac{\frac{1}{x^3y} + \frac{2}{xy^2}}{\frac{4}{xy} + \frac{1}{x^2y}}$

f. $4 - \frac{11}{x} - \frac{3}{x^2}$
 $2 - \frac{1}{x} - \frac{15}{x^2}$

16. Perform the indicated operation. Be sure to simplify your answer if possible.

a. $\frac{x^2-4x+4}{4x^2} \cdot \frac{2x}{x-2}$

b. $\frac{2x^2-5x-12}{x^2-10x+24} \div \frac{4x^2-9}{x^2-9x+18}$

c. $\frac{2x+3}{3-x} + \frac{x^2}{x-3}$

d. $\frac{x^2-4x}{2x} - \frac{x^2-16}{3}$

e. $\frac{x^2-16}{x^2-16} - \frac{x^2+8x+16}{x^2+8x+16}$

17. Solve.

a. $\frac{x}{x-2} + \frac{3}{x+2} = \frac{8}{x^2-4}$

$$\begin{aligned} \text{b. } & \frac{2x-1}{x^2+2x-8} + \frac{2}{x+4} = \frac{1}{x-2} \\ \text{c. } & \frac{x+3}{3} - \frac{2}{x-3} = -\frac{12}{x^2-9} \\ \text{d. } & \frac{5}{x-2} = 7 - \frac{10}{x+2} \end{aligned}$$

18. Evaluate.

$$\begin{aligned} \text{a. } & -\sqrt{\frac{81}{100}} \\ \text{b. } & \sqrt{-\frac{81}{100}} \\ \text{c. } & \sqrt[4]{256} \\ \text{d. } & \sqrt[3]{-64} \end{aligned}$$

19. Simplify.

$$\begin{aligned} \text{a. } & \sqrt{80} \\ \text{b. } & \sqrt{56} \\ \text{c. } & \sqrt{45} \\ \text{d. } & \sqrt{72x^5y^8z^2} \\ \text{e. } & \sqrt[3]{343x^9y^3} \end{aligned}$$

20. Perform each indicated operation, and simplify.

$$\begin{aligned} \text{a. } & 5\sqrt{12} + 16\sqrt{27} \\ \text{b. } & \sqrt{5x} + 2\sqrt{45x^3} \\ \text{c. } & 5\sqrt{6} \cdot 2\sqrt{10} \\ \text{d. } & \sqrt{5x^7} \cdot \sqrt{15x^3} \\ \text{e. } & \frac{\sqrt{40xy^3}}{\sqrt{8x}} \\ \text{f. } & (2\sqrt{5} - \sqrt{7})(3\sqrt{5} + 4\sqrt{7}) \end{aligned}$$

21. Rationalize the denominator.

$$\begin{aligned} \text{a. } & \frac{12}{\sqrt{72}} \\ \text{b. } & \frac{\sqrt{12}}{\sqrt{3}-1} \\ \text{c. } & \sqrt[3]{9} \\ \text{d. } & \frac{4\sqrt{5}}{3\sqrt{2}} \\ \text{e. } & \frac{3-\sqrt{2}}{5+\sqrt{6}} \end{aligned}$$

22. Solve.

$$\begin{aligned} \text{a. } & \sqrt{5x+4} = 3\sqrt{x} \\ \text{b. } & \sqrt{4x+1} = x-1 \\ \text{c. } & \sqrt[3]{x+5} = 2 \end{aligned}$$

- d. $\sqrt{5x + 3} = 2$
 e. $x = 2\sqrt{x - 1}$
 f. $x = \sqrt{x^2 - 2x - 6}$
 g. $2 + \sqrt{12 - 2x} = x$

23. Simplify.

- a. $81^{1/2}$
 b. $-125^{1/3}$
 c. $8^{5/3}$
 d. $7^{2/3} \cdot 7^{7/3}$
 e. $\frac{x^{1/4} \cdot x^{5/4}}{x^{3/4}}$

24. Solve the following equations by using the square root property.

- a. $(x + 3)^2 = 64$
 b. $(4x + 3)^2 = 24$

25. Solve the following equations by completing the square. Then solve by using the quadratic formula.

- a. $x^2 = -12x + 13$
 b. $x^2 - 4x + 4 = 0$
 c. $2x^2 + 12x = -5$
 d. $6x^2 + 6x = 0$
 e. $(x + 3)(x + 2) = 15$

26. Find $f(2)$, $f(0)$, and $f(-3)$ for the function $f(x) = 3x^2 - 4x + 2$.

27. If 2 is subtracted from a number and this difference is tripled, the result is 6 more than the number. Find the number.

28. If five times the lesser of two consecutive integers is added to three times the greater, the result is 59. Find the integers.

29. The perimeter of a triangle is 28 ft. The medium side is 4 ft longer than the shortest side, while the longest side is twice as long as the shortest side. What are the lengths of the three sides?

30. The distance between Singapore and Tokyo is 3300 mi. On a certain wall map, this distance is represented by 11 in. The actual distance between Mexico City and Cairo is 7700 mi. How far apart are they on the same map?

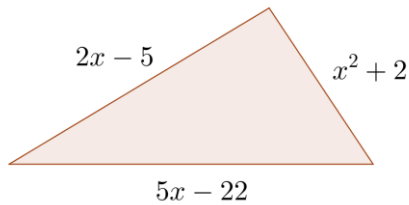
31. How many liters of a 10% alcohol solution must be mixed with 40 L of a 50% solution to get a 40% solution?

32. How many gallons of a 60% acid solution must be mixed with a 75% acid solution to get 20 gal of a 72% solution?

33. How many pounds of nuts selling for \$6 per lb and raisins selling for \$3 per lb should you combine to obtain 60 lb of a trail mix selling for \$5 per lb?

34. Two cars leave towns 230 km apart at the same time, traveling directly toward one another. One car travels 15 km per hr slower than the other. They pass one another 2 hr later. What are their rates?

35. Find a polynomial that represents the perimeter of the following triangle.



36. A toolbox is 2 ft high, and its width is 3 ft less than its length. If its volume is 80 ft^3 , find the length and width of the box.

37. The hypotenuse of a right triangle is 3 in. longer than the longer leg. The shorter leg is 3 in. shorter than the longer leg. Find the lengths of the sides of the triangle.

38. A river has a current of 4 km per hr. Find the rate of a boat in still water if it goes 40 km downstream in the same time that it takes to go 24 km upstream.

39. One roofer can put a new roof on a house three times faster than another. Working together, they can roof a house in 4 days. How long would it take the faster roofer working alone?

40. Working alone, Jorge can paint a room in 8 hours. Sarah can paint the same room working alone in 6 hours. How long will it take them if they work together?