

### Math 51 - Final Exam Review Sheet

**Please Note:** The review sheet is designed for you to have a guide as to what to study. The problems on the exam are not limited to the type of problems on this sheet. Any type of problem from the assigned homework problems are possible exam questions. Also, it is advisable to review the standard form of a line and the point-slope form of a line. As a reminder, all word problems will need to be solved using an algebraic equation or a system of linear equations. Please attempt other practice problems other than those presented on this sheet in order to be completely prepared for the exam.

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

a.  $(y+3)^2 = 64$

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

2. 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.  $(x+3)(x+2) = 15$

f.  $6y^2 + 2y - 1 = 0$

3. Perform the indicated operations.

a.  $5\sqrt{12} + 16\sqrt{27}$

b.  $\sqrt{5a} + 2\sqrt{45a^3}$

c.  $\sqrt{10} \cdot \sqrt{5}$

d.  $\sqrt{5a^7} \cdot \sqrt{15a^3}$

e.  $\frac{\sqrt{40xy^3}}{\sqrt{8x}}$

f.  $(2\sqrt{5} - \sqrt{7})(3\sqrt{5} + 4\sqrt{7})$

4. Rationalize the denominator.

a.  $\frac{12}{\sqrt{72}}$

b.  $\frac{\sqrt{12}}{\sqrt{3}-1}$

c.  $\frac{5}{\sqrt[3]{9}}$

d.  $\frac{7}{\sqrt[5]{8}}$

e.  $\frac{4\sqrt{5}}{3\sqrt{2}}$

f.  $\frac{3-\sqrt{2}}{5+\sqrt{6}}$

5. Solve each equation.

a.  $\sqrt{m}-5=0$

b.  $\sqrt{5m+4}=3\sqrt{m}$

c.  $\sqrt{4y+1}=y-1$

d.  $\sqrt[3]{x+5}=2$

e.  $\sqrt{5t+3}=2$

f.  $x=2\sqrt{x-1}$

g.  $\sqrt{3-x+x^2}=x-2$

h.  $2+\sqrt{12-2x}=x$

6. Simplify each expression.

a.  $81^{1/2}$

b.  $-125^{1/3}$

c.  $7^{2/3} \cdot 7^{7/3}$

d.  $\frac{x^{1/4} \cdot x^{5/4}}{x^{3/4}}$

e.  $\sqrt[8]{49^4}$

7. Solve for  $x$ .

a.  $4x+6=-(x-2)$

b.  $10(2x-1)=8(2x+1)+14$

$$c. 3(x-2)+7=2(x+5)$$

$$d. 3(x-4)-4(x-3)=x+3-(x-2)$$

$$e. 7(x+1)=4[x-(3-x)]$$

$$f. \frac{3}{5}x - \frac{1}{10}x = x - \frac{5}{2}$$

$$g. \frac{x}{5} = \frac{x}{6} + 1$$

$$h. 2x - \frac{2x}{7} = \frac{x}{2} + \frac{17}{2}$$

$$i. \frac{x+1}{4} = \frac{1}{6} + \frac{2-x}{3}$$

8. Simplify each of the following expressions.

$$a. (2x^2y^5)^5$$

$$b. \left(\frac{6x^3y^9}{z^5}\right)^4$$

$$c. \left(\frac{-2x^4y^{-2}z^{-3}}{3x^{-2}y^6z^{-4}}\right)^{-4}$$

$$d. \frac{(6r^{-1})^2(2r^{-4})}{r^{-5}(r^2)^{-3}}$$

$$e. \frac{(a^{-2}b^{-3}c^{-4})^{-5}}{(a^2b^3c^4)^5}$$

$$f. \frac{(x^{-1}y^2z)^{-2}}{(x^{-3}y^3z)^{-1}}$$

$$g. \frac{(x+2y)^{-3}}{(x+2y)^{-5}}$$

9. Multiply each of the following polynomials.

$$a. (5x+3y)(6x-5y)$$

$$b. (9y-2)(8y^2-6y+1)$$

$$c. 5t^4(2t-3)(6t+5)$$

$$d. (4x-3)^2$$

10. Divide each of the following polynomials.

$$a. (t^2+2t-35) \div (t-5)$$

$$b. (8t^8+24t^7-16t^5+12t^4) \div (8t^6)$$

$$c. (6r^4-11r^3-r^2+16r-8) \div (2r-3)$$

11. Factor each of the following polynomials completely.

$$a. s^2-6s-27$$

$$b. m^2-12m+36$$

$$c. 15x^2-14x-8$$

$$d. a^3+a^2-4a-4$$

$$e. x^3-27$$

$$f. 8w^3+125$$

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

$$h. 6x^3-6x$$

$$i. q^3-q^2+q-1$$

$$j. x^2+100$$

$$k. 27p^{10}-45p^9-252p^8$$

$$l. x^2-17x+66$$

$$m. y^2-4yk-12k^2$$

$$n. 4x^5+12x^4-40x^3$$

$$o. 20x^2+22x+6$$

$$p. 9p^2-18p+8$$

$$q. 24x^2-42x+9$$

$$r. 6x^2-5xy-y^2$$

$$s. 24x^4+10x^3-4x^2$$

$$t. 2w^3-2w^2+3w-3$$

- u.*  $15x^2 - 14x - 8$
- v.*  $-3x^3 + 27x$
- w.*  $9x^2 - 12xy + 4y^2$
- x.*  $x^2 - 12x - 28$
- y.*  $24x^2 - 46x + 10$
- z.*  $27x^3 - 64y^3$
- aa.*  $10x^2 + 19x + 6$
- bb.*  $6x^2 - 7xy - 5y^2$
- cc.*  $64x^2 - 16y^2$
- dd.*  $x^2 - 14x + 49$
- ee.*  $9x^2 + 48xy + 64y^2$
- ff.*  $2x^3y - 32xy$

12. Solve the following for  $x$ .

- a.*  $x^2 - x - 20 = 0$
- b.*  $x^2 - 4x = 12$
- c.*  $6x^2 - 7x + 2 = 0$
- d.*  $(x - 6)(2x^2 - 5x - 3) = 0$
- e.*  $x^2 - 49 = 0$
- f.*  $(x - 3)(x + 2) = 14$

13. Perform the indicated operation.

- a.*  $\frac{x^3y^2}{x^2y^4} \cdot \frac{y^6}{x^5}$
- b.*  $\frac{x+1}{3-x} + \frac{x^2}{x-3}$
- c.*  $\frac{2}{x^2-4x} - \frac{3}{x^2-16}$
- d.*  $\frac{3t^2-t}{6t^2+15t} \div \frac{6t^2+t-1}{2t^2-5t-25}$
- e.*  $\frac{\frac{1}{x^2} + \frac{1}{y^2}}{\frac{1}{x} - \frac{1}{y}}$

14. Solve for  $x$ . Remember to check your answer.

a.  $\frac{x+2}{3} = \frac{2x-1}{5}$

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

c.  $\frac{8}{x^2-9} + \frac{4}{x+3} = \frac{2}{x-3}$

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

e.  $\frac{2x-1}{x^2+2x-8} + \frac{2}{x+4} = \frac{1}{x-2}$

15. Find the slope,  $x$ -intercept and  $y$ -intercept of the following linear functions. Then, graph the equation.

a.  $y = \frac{2}{3}x - \frac{3}{4}$

b.  $5x - 4y = 20$

c.  $\frac{1}{3}x + y = 2$

d.  $x + 2y = 4$

e.  $3x + 2y = 6$

f.  $x = 5$

g.  $y = 3$

16. Determine the equation of the following lines based on the given information. Remember to leave your answer in *slope-intercept form*.

a. Find the equation of a line that is parallel to  $x + 2y = 6$  and passing through the point  $(3, 7)$ .

b. Find the equation of a line that is perpendicular to  $3x + 4y = 5$  and passing through the point  $(3, -2)$ .

c. Find the equation of a line passing through the points  $(3, 4)$  and  $(6, 2)$ .

d. Find the equation of a line with a slope of  $\frac{2}{3}$  and passing through the point  $(1, 5)$ .

- e. Find the equation of a vertical line that passes through the point  $(3, 2)$ .  
f. Find the equation of a horizontal line that passes through the point  $(-2, 5)$

17. Solve the following system of equations. Remember that you will need to know how to use the graphing, substitution, and addition methods.

a. 
$$\begin{cases} x - 2y = 16 \\ y + 3 = 3x \end{cases}$$

b. 
$$\begin{cases} 3x - 5y = 11 \\ 2x - 6y = 2 \end{cases}$$

c. 
$$\begin{cases} x - 3y = -6 \\ 3x - 9y = 9 \end{cases}$$

18. Graph the following inequalities.

- a.  $2x - 3y \geq 6$   
b.  $3x + 5y \leq 10$   
c.  $2x - y \leq 4$   
d.  $3x + 2y > -6$

19. Given the following functions.

$$f(x) = 3x^2 - 4x + 2, \quad g(x) = \frac{5}{x-4}, \quad h(x) = -4x^2 + 2x + 8$$

Evaluate:

- a.  $f(2)$   
b.  $g(1)$   
c.  $f(x-3)$   
d.  $h(-3)$

20. Find the domains of the following functions.

- a.  $f(x) = \frac{3}{2x-5}$   
b.  $f(x) = 2x+1$   
c.  $f(x) = \frac{7x}{5-x}$

21. Simplify the following radicals.

a.  $\sqrt{56}$

b.  $\sqrt{45}$

c.  $\sqrt{80}$

d.  $\sqrt{72x^5y^8z^2}$

22. Evaluate the following expressions.

a.  $\frac{6(3^2-1)+8}{3 \cdot 2-2}$

b.  $3+2(4-8 \div 2)-(4+5[6-3]^2)$

c.  $2+18 \div 3 \cdot 2-5$

d.  $\frac{5}{3} + \frac{1}{6} - \frac{1}{2}$

e.  $2|5-(-3)|-4(3-6)^2$

23. Evaluate the following expressions if  $x = 3$ ,  $y = -2$ ,  $z = 5$

a.  $5x-3y+4z$

b.  $4x^2-2y$

c.  $2x^2-4y^2-z^2$

24. Solve the following inequalities. Write the solution set in interval notation.

a.  $4x-(6x+1) \leq 8x+2(x-3)$

b.  $-w+12+9w > w+9+w$

c.  $2(x-5)+3x < 4(x-6)+1$

d.  $5 < 1-6m < 12$

e.  $-7 \leq 3x-4 \leq 8$

f.  $2 < 6 + \frac{3}{4}x \leq 12$

g.  $-12 \leq \frac{3}{7}x+2 < -4$



25. Perform the indicated operation.

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

b.  $(5x^2y - 2xy + 9xy^2) - (8x^2y + 13xy + 12xy^2)$

c.  $[(6t^2 - 3t + 1) - (12t^2 + 2t - 6)] - [(4t^2 - 3t - 8) + (-6t^2 + 10t - 12)]$

26. The sum of two consecutive integers is 137. Find the integers.

27. In one day Akilah Cadet received 13 packages. Federal Express delivered three times as many as Airborne Express, while United Parcel Service delivered 2 less than Airborne Express. How many packages did each service deliver to Akilah?

28. Find two consecutive even integers such that the smaller added to three times the larger gives a sum of 46.

29. If 6 is subtracted from the largest of three consecutive odd integers, with this result multiplied by 2, the answer is 23 less than the sum of the first and twice the second of the integers. Find the integers.

30. At a given hour two steamboats leave a city in the same direction on a straight canal. One travels at 18 miles per hour and the other travels at 25 miles per hour. In how many hours will the boats be 35 miles apart?

31. St. Louis and Portland are 2060 miles apart. A small plane leaves Portland, traveling towards St. Louis at an average speed of 90 mph. Another plane leaves St. Louis at the same time, traveling toward Portland, averaging 116 mph. How long will it take them to meet?

32. The largest drum ever constructed was played at the Royal Festival Hall in London in 1987. It had a diameter of 13 feet. What was the area of the circular face of the drum?

33. If sales tax on a \$16.00 compact disc is \$1.32, how much would the sales tax be on a \$120.00 compact disc player?

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

35. If 2 is subtracted from a number and this difference is tripled, the result is 4 more than the number. Find the number.

36. How many gallons of 50% antifreeze must be mixed with 80 gallons of 20% antifreeze to get a mixture that is 40% antifreeze?

37. Find two consecutive even integers such that the smaller added to three times the larger gives a sum of 46.

38. The length of a rectangle is three times the width. If the width were increased by 3 meters while the length remained the same, the new rectangle would have an area of 30 square meters. Find the length and width of the original rectangle.
39. Doug's copier can do a printing job in 7 hours. Scott's copier can do the same job in 12 hours. How long would it take to do the job using both copiers?
40. Working alone, Jorge can paint a room in 8 hours. Caterina can paint the same room working alone in 6 hours. How long will it take them if they work together?
41. An experienced employee can enter tax data into a computer twice as fast as a new employee. Working together, it takes the employees 2 hours. How long would it take the experience employee working alone?
42. Deep Thought Granola is 25% nuts and dried fruit. Oat Dream Granola is 10% nuts and dried fruit. How much of Deep Thought and how much of Oat Dream should be mixed to form a 20-lb. batch of granola that is 19% nuts and dried fruit.
43. Trip goes to a bank and gets change for a \$50 bill consisting of all \$5 bills and \$1 bills. There are 22 bills in all. How many of each kind are there?
44. Hoshi paddled for 4 hours with a 6-km/h current to reach a campsite. The return trip against the same current took 10 hours. Find the speed of Hoshi's canoe in still water.
45. In still water, a boat averages 8 miles per hour. It takes the same amount of time to travel 15 miles downstream, with the current, as 9 miles upstream, against the current. What is the rate of the water's current?
46. The speed of the current in Willow Creek is 3 mph. Bill's kayak can travel 4 mi upstream in the same time it takes to travel 10 mi downstream. What is the speed of Bill's kayak in still water?
47. Luevenia can row 4 miles per hour in still water. It takes as long to row 8 miles upstream as 24 miles downstream. How fast is the current?
48. Alvin paddled for 4 hr with a 6-km/h current to reach a campsite. The return trip against the same current took 10 hr. Find the speed of Alvin's canoe in still water.
49. The foot of an extension ladder is 10 ft from a wall. The ladder is 2 ft longer than the height that it reaches on the wall. How far up the wall does the ladder reach?
50. The diagonal of a rectangle measures 25 centimeters. The width of the rectangle is 7 centimeters. Find the length of the rectangle.