

The following formulas may or may not be useful:  $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

1. Sketch the following intervals on the number line .

(a).  $-3 \leq x < 2$

(b).  $(-\infty, 6]$

2. Find the distance between  $a = 45$  and  $b = -30$ .

3. Evaluate each of the following expressions for the given value of  $x$ .

(a).  $-3x - 2$ ,  $x = -4$ .

10

(b).  $6x^{-2}$ ,  $x = 2$

$\frac{3}{2}$

4. Evaluate the following. Simplify and reduce fractions, when possible.

(a).  $|4 + 6| - |4 - 6|$       8

(b).  $\frac{1}{2} - \frac{2}{3} + \frac{5}{8}$        $\frac{11}{24}$

(c).  $\frac{3 \cdot 2^{-2}}{-3^3 \cdot 2^{-1}}$        $-\frac{1}{18}$

(d).  $-2^4$       -16

5. Simplify the following expressions.

(a).  $(-3x)^3$        $-27x^3$

(b).  $\left(\frac{3}{z}\right)^2 \left(\frac{2}{z}\right)^{-3}$        $\frac{9z}{8}$

6. Rewrite each expression with positive exponents and simplify.

(a).  $3(2xy^0)^{-2}$        $\frac{3}{4x^2}$

(b).  $5^n \cdot 5^{3n}$        $5^{4n}$

7. Evaluate the following powers and roots. If it is not a real number, clearly state so.

(a).  $\sqrt[5]{-32}$       -2

(b).  $\left(\frac{36}{25}\right)^{1/2}$        $\frac{6}{5}$

8. Simplify the following expressions and leave the radical sign in your answer. [Assume nonnegative variables.]

(a).  $\sqrt{27a^4b^7}$        $3a^2b^3\sqrt{3b}$

(b).  $4\sqrt{9y} + 5\sqrt{y}$        $17\sqrt{y}$

9. Rationalize the denominator and simplify:  $\frac{10}{\sqrt{5}} = 2\sqrt{5}$

10. Simplify the following. Use only positive exponents (i.e. no radicals, no negative exponents).

(a).  $\sqrt[3]{x^5}$   $x^{5/3}$  (b).  $y \cdot y^{-2} \cdot y^{-1/2} \cdot y^{5/2}$   $y$

11. Perform the indicated operations and simplify.

(a).  $(x - 2y)(x + 2y)$   $x^2 - 4y^2$  (b).  $(4a + 3b)^2$   $16a^2 + 24ab + 9b^2$   
 (c).  $2x(x - 3)(4x - 1)$   $8x^3 - 26x^2 + 6x$  (d).  $(x^2 - 3x + 1)(2x^2 + x - 4)$   $2x^4 - 5x^3 - 5x^2 + 13x - 4$

12. Section P.3 #89

13. Factor completely.

(a).  $2x^3y + 2xy - 3x^2 - 3$  [Grouping]  $(x^2 + 1)(2xy - 3)$  (b).  $2x^3 - 8x$   $2x(x + 2)(x - 2)$   
 (c).  $x^2 + 3x - 4$   $(x + 4)(x - 1)$  (d).  $3x^2 - 10x + 8$   $(3x - 4)(x - 2)$   
 (e).  $x^4 + 12x^2 + 36$   $(x^2 + 6)^2$  (f).  $6x^2 - 7x - 5$   $(2x + 1)(3x - 5)$

14. Use one of the factorization formulas involving cubes to factor  $8x^3 + 1$   $(2x + 1)(4x^2 - 2x + 1)$

15. Perform the indicated operations and simplify.

(a).  $\frac{3x + 9}{x^2 - 9} \cdot \frac{x^2 - 6x + 9}{9}$   $\frac{x - 3}{3}$  (b).  $\frac{x^2 - 4x + 3}{1 - x^2} \div (x^2 + x - 12)$   $\frac{-1}{(1 + x)(x + 4)}$   
 (c).  $\frac{1 - 2a}{4a} - \frac{a + 1}{4a}$   $-\frac{3}{4}$  (d).  $\frac{4}{3} + \frac{2x + 1}{4}$   $\frac{19 + 6x}{12}$   
 (e).  $\frac{x}{x + 2} - \frac{x + 2}{x^2 - 4} + 3$   $\frac{4x^2 - 3x - 14}{(x + 2)(x - 2)}$  (f).  $\frac{3a^2bc^4}{8a^3b^2c^5} \div \frac{2abc}{a^2b^3c^2}$   $\frac{3b}{16}$

16. Simplify the complex fraction.  $\frac{\frac{x}{\sqrt{y}} + \sqrt{y}}{x + y}$   $\frac{1}{\sqrt{y}} = \frac{\sqrt{y}}{y}$

17. Given the points (2, -4) and (5, 8).

(a). Plot the points in the Cartesian plane.

(b). Find the distance between the two points.  $\sqrt{153}$  (c). Find the midpoint between the two points.  $\left(\frac{7}{2}, 2\right)$

18. Section P.6 #40

\$2.36

19. Does the point (4, 2) lie on the graph of  $x^2 - y = 0$ .

No

20. Use the algebraic tests to check for symmetry with respect to both axes and the origin for  $y = x^3 - x$ .

*x*-axis symmetry: No

*y*-axis symmetry: No

Symmetry with respect to the origin: Yes

21. Write an equation of a circle with center at (3,-1) and radius 4.

$$(x - 3)^2 + (y + 1)^2 = 16$$

22. Solve the following equations. If there is no solution, clearly state so.

(a).  $3(4 - 2x) + 3 = 4x + 1$

$$\frac{7}{5}$$

(b).  $\frac{2x}{3} + 2x = \frac{3}{2}$

$$\frac{9}{16}$$

(c).  $\frac{1}{x} + \frac{2}{x - 6} = 0$

$$x = 2$$

(d).  $\frac{1}{x} + \frac{3}{x - 6} = \frac{2x + 6}{x(x - 6)}$

No Solution

23. The annual operating costs for a truck used for a small business is given by  $C = 0.25m + 1800$ , where  $m$  is the number of miles traveled by a truck in one year. What number of miles will yield an annual operating cost of \$5000?

12800 miles

24. Write a mathematical model for and solve the following problem: The sum of 3 consecutive natural numbers is 465.

154, 155, 156

25. You invest \$12,000 at 3.5% and 4.5% simple interest. During one year, the two accounts earned \$500. How much did you invest in each account?

\$4000 at 3.5% and \$8000 at 4.5%.

26. Solve

(a). By factoring:  $x^2 - 9x + 20 = 0$

$$x = 5, 4$$

(b). By extracting the square roots:  $(4x + 3)^2 = 16$

$$x = \frac{1}{4}, -\frac{7}{4}$$

(c). By completing the square:  $x^2 + 12x + 9 = 0$

$$x = -6 \pm 3\sqrt{3}$$

(d). By using the quadratic formula:  $2x^2 + 2x = 1$

$$x = \frac{-1 \pm \sqrt{3}}{2}$$

(e). By any method:  $2x^2 + 5x = 12$

$$x = \frac{3}{2}, -4$$

27. Section 1.4 #120, 126

28. Solve the following equations for  $x$ . Check your solutions.

(a).  $x^4 + 2x^3 + 3x^2 + 6x = 0$

$$x = 0, -2$$

(b).  $4x^3 - 4x^2 - 24x = 0$

$$x = 0, 3, -2$$

(c).  $x^4 - 9x^2 + 20 = 0$  [Quadratic Type]

$$x = \pm 2, \pm\sqrt{5}$$

(d).  $x = \frac{3}{x} - 2$

$$x = -3, 1$$