

1. Simplify:

- (a)  $(4x^{-2}) \cdot (8x^{-3})$
- (b)  $(4x^{-2}) - (8x^{-2})$
- (c)  $(4x^{-2}) \div (8x^{-2})$
- (d)  $(4x^{-2}) + (8x^{-2})$

2. Factor fully:

- (a)  $x^2 - 10x - 24$
- (b)  $x^2 - 64$
- (c)  $x^4 - 13x^2 + 36$
- (d)  $6x^2 - 41x + 30$
- (e)  $4x^3 - 32x^2 - x + 8$
- (f)  $x^3 - 10x^2 + 19x + 30$
- (g)  $56x^3 - 7$

3. Rationalize the denominator and simplify:

- (a)  $\frac{4x^2}{\sqrt{2x}}$
- (b)  $\frac{x^2 - 4}{\sqrt{x-2}}$
- (c)  $\frac{8}{\sqrt{4+x} - \sqrt{x}}$

4. Solve the following equations by factoring:

- (a)  $3x^2 + 9x - 30 = 0$
- (b)  $6x^2 + 11x - 10 = 0$
- (c)  $4x^3 + 3x^2 - 16x - 12 = 0$
- (d)  $2x^3 - x^2 - 13x - 6 = 0$

5. Solve the following equations using the quadratic formula:

- (a)  $x^2 + 6x - 12 = 0$
- (b)  $5x^2 - 10x + 4 = 0$

6. Simplify by extracting a common factor:

- (a)  $x^{3/2} + \frac{3}{2}x(x-3)$
- (b)  $6x^2(x^2 - 4)^2 - (x^2 - 4)^3$
- (c)  $5x(x-6)^{3/2} + 2(x-6)^{5/2}$

7. Find a common denominator and simplify:

- (a)  $\frac{4}{x-2} + \frac{3}{x+6}$
- (b)  $\frac{-4x}{(2x+3)^2} + \frac{1}{(2x+3)^2}$
- (c)  $\frac{x^2}{2\sqrt{x-5}} + 2x\sqrt{x-5}$

8. Determine the missing factor in each of the following:

- (a)  $6 + \sqrt{4x+16} = 2(\dots)$
- (b)  $\frac{3}{x^2} - \frac{1}{x} + 5 = x^{-c}(\dots)$
- (c)  $\sqrt{4x+1} = \sqrt{x}(\dots)$
- (d)  $(x^2 - 3) = (x - \sqrt{3})(\dots)$
- (e)  $x + 8 = (\sqrt[3]{x} + 2)(\dots)$
- (f)  $\frac{2}{3}x(2x-1)^{-2a} + (2x-1)^{1/a} = \frac{1}{3}(2x-1)^{-2a}(\dots)$

9. Solve:

- (a)  $(3x-2)(x+3) \leq 0$
- (b)  $\frac{2x-3}{x+4} \leq -1$
- (c)  $\frac{3}{x+2} - \frac{2}{x-1} \geq 0$

10. On what interval(s) are the following functions positive?

- (a)  $f(x) = x^2 - 7x + 12$
- (b)  $f(x) = (x-4)(x-1)(x+5)$
- (c)  $f(x) = \frac{x^2-4}{x^2}$

11. Solve for  $x$ :

- (a)  $|3x-4| = 5$
- (b)  $|2x-1| = x+3$

12. Find the equation of the line:

- (a) with slope  $-2/3$  and  $y$ -intercept 4.
- (b) with slope  $-2/3$  and  $x$ -intercept 4.
- (c) that passes through the point  $(4, -5)$  with slope  $3/4$ .
- (d) that passes through the points  $(-6, 2)$  and  $(-3, 4)$ .

13. Express each of the following in the form  $a(x-p)^2 + q$  by completing the square.

- (a)  $x^2 + 8x + 20$
- (b)  $x^2 - 5x + 8$
- (c)  $-2x^2 + 12x - 9$

14. Evaluate the following at  $2$  and at  $2+h$ :

- (a)  $f(x) = -3x + 5$
- (b)  $f(x) = 2x^2 - 4x + 7$
- (c)  $f(x) = \frac{6}{x-5}$

15. In each of the following cases, determine if the sequence is arithmetic or geometric and find the eighth term and the  $n$ th term:

- (a)  $-3, -12, -21, -30, \dots$
- (b)  $3, 12, 48, 192, \dots$
- (c)  $18, 6, 2, 2/3, \dots$

16. In each of the following cases, determine if the series is arithmetic or geometric and find the sum:

- (a)  $1 - 2 + 4 - 8 + \dots$  to 12 terms
- (b)  $1 + 3 + 5 + 7 + \dots$  to 25 terms
- (c)  $37 + 34 + 31 + 28 + \dots$  to 15 terms

17. Consider the geometric series:

$$1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots$$

- (a) Find the sum of the first 4 terms.
- (b) Find the sum of the first 8 terms.
- (c) Show that the sum of the first  $n$  terms is

$$S_n = \frac{2^n - 1}{2^{n-1}}$$

- (d) What is the sum of an infinite number of terms?

# Answers to Exercises

ad' (cometes)  
 6.  
 produce a six-leaved  
 wing curves. (These

### Exercise 1.1, Page 12

1. (a) 1, 2
2. 0
3.  $y = 2x - 5$
4. (a) 11 (b) 20, between 11 and 20, 155
5. (a) 28.4 (b) 28.9
6. 105 km/h
7. (a)  $\frac{\sqrt{2}}{2}$  (b)  $\frac{1}{\sqrt{2}}$   
 no, actual speed fluctuates about the average
8. (a)  $5\sec^2(5x)$  (b)  $\frac{1}{2}\sec^2(\frac{1}{2}x)$
9. (a)  $x^{-1} + C$  (b)  $\frac{2}{3}x^{3/2}$  (c)  $\frac{1}{3.5}x^{3.5}$
10. (a)  $\frac{1}{4}\sin(4x) + C$  (b)  $-3\sin(\frac{1}{3}x) + C$   
 (c)  $2\sin(0.5x) + C$
11. rate of change of height at age 6  
 yes, because at different times in one's life the rate of growth is different.
12. length decreases  
 area increases then decreases  
 the  $5 \times 5$  square
13. 566, 600, 621, 626, 628
14. (a) 1382.3 cm<sup>3</sup> (b) overestimates the volume  
 (c) use more disks
15. (a) 111 (b) underestimate  
 (c) use more line segments
16. (a) 1.25 m, 0.625 m, 0.3125 m  
 (b) 8.75 m, 9.375 m, 9.6875 m  
 (c) There is no last jump.

### Exercise A, Page 27

1. (a)  $32x^2 - 1$  (b)  $-4x^2$  (c) 12 (d)  $12x^2$
2. (a)  $(x-12)(x+2)$   
 (b)  $(x-6)(x+8)$   
 (c)  $(x-2)(x+2)(x-3)(x+3)$   
 (d)  $(6x-5)(x-6)$
3. (a)  $(x-8)(2x+1)(2x-1)$   
 (b)  $(2x-1)(x-3)(x-6)$   
 (c)  $2\sqrt{2x-1}(4x+2x+1)$   
 (d)  $2\sqrt{4+x+\sqrt{3}}$
4. (a)  $-5.2$  (b)  $-\frac{3}{4}$  (c)  $-2.1$  (d)  $1.2$

*Answers Start here*

### Exercise B, Page 36

1. (a)  $-2, -\frac{1}{2}, 3$
5. (a)  $-3 \pm \sqrt{21}$  (b)  $\frac{5 \pm \sqrt{5}}{5}$
6. (a)  $\frac{1}{2}x^2(5x-9)$   
 (b)  $(x^2-4)^2(5x-12)$   
 (c)  $(x-6)^2x(7x-12)$
7. (a)  $\frac{7x+18}{5x^2-20x}$  (b)  $\frac{-2x+3}{(2x+3)^2}$
8. (a)  $3 + \sqrt{x+4}$  (b)  $3-x+5x^2$   
 (c)  $\sqrt{4+x-1}$  (d)  $x + \sqrt{3}$   
 (e)  $x^2 - 2x^3 + 4$  (f)  $8x-3$
9. (a)  $-3 \leq x \leq \frac{3}{2}$  (b)  $-4 < x \leq -\frac{1}{2}$
10. (a)  $x \geq 7$  or  $-2 < x < 1$   
 (b)  $x > 4$  or  $x < 3$  (c)  $x > 4$  or  $-5 < x < 1$
11. (a)  $-\frac{4}{3}, 3$  (b)  $-\frac{3}{4}, 4$
12. (a)  $y = -\frac{3}{2}x + 4$  (b)  $y = -\frac{3}{2}x + \frac{3}{2}$   
 (c)  $y = \frac{3}{2}x - 8$  (d)  $y = \frac{3}{2}x + 6$
13. (a)  $(x+4)^2 + 4$  (b)  $(x-\frac{3}{2})^2 + \frac{1}{4}$
14. (a)  $-1, -1-3h$  (b)  $7, 2h^2 + 4h + 7$   
 (c)  $-2, \frac{h-3}{6}$
15. (a) arithmetic,  $-66, 6-9n$   
 (b) geometric,  $49152, 3(4)^{n-1}$   
 (c) geometric,  $248, 2(3)^{n-1}$
16. (a) geometric,  $-1365$  (b) arithmetic, 625  
 (c) arithmetic, 240
17. (a)  $\frac{1}{2}$  (b)  $\frac{1}{25}$  (d) 2
3. (a) zeros: 3, 4  
 positive:  $x < 3, x > 4$  negative:  $3 < x < 4$   
 (b) zeros: 1  
 positive:  $x > 1$  negative:  $x < 1$   
 (c) zeros:  $-3, 2, 4$   
 positive:  $x < -3, -3 < x < 2, x > 4$   
 negative:  $2 < x < 4$