

Algebra/PreCalculus Review Solutions

Exponents, Page 3

1. $(-4)^5 = -1024$

4. $-2^0 = -1$

7. $8x^{15}y^{12}$

10. $\frac{r^{24}}{s^6}$

2. $(-5)^8 = 390625$

5. $(5m)^0 = 1$

8. $16m^6n^{18}$

11. $\frac{x^{16}}{x^8} = x^8$

3. $2^0 = 1$

6. $2^{10} = 1024$

9. $-\frac{p^8}{q^2}$

12. $(x^7)^3 = x^{21}$

13. $\frac{1}{(-4)^3} = -\frac{1}{64}$

14. $\frac{1}{(-5)^2} = \frac{1}{25}$

15. $\frac{1}{5^{-2}} = 5^2 = 25$

16. $\frac{1}{5^3} = \frac{1}{125}$

17. $\frac{3}{x^2}$

18. $\frac{1}{(5y)^2} = \frac{1}{25y^2}$

19. $x^2y^{-1} = \frac{x^2}{y}$

20. $\frac{x}{y^3}$

21. $\frac{5m^2}{n^4}$

22. $\frac{2y^4}{x^3}$

23. $\frac{x^{-6}}{y^{10}} = \frac{1}{x^6y^{10}}$

24. $\frac{1}{y^3}$

25. $2^{-7} = \frac{1}{2^7}$

26. $5^{-8} = \frac{1}{5^8}$

27. $9^{-5} = \frac{1}{9^5}$

28. $\frac{4^{-3}}{4^{-3}} = 1$

29. $\frac{3^{-5}}{3^0} = \frac{1}{3^5}$

30. $\frac{7^4r^{-1}}{7^2} = \frac{7^2}{r}$

31. $\frac{r^6}{s^{15}}$

32. $\frac{-4a^3}{a^{-2}} = -4a^5$

33. $\frac{x^{-5}}{4y^{-3}} = \frac{y^3}{4x^5}$

34. $\frac{5^0x^0}{x^0y^0} = 1$

35. $\left(\frac{x^6}{y^{-4}}\right)^{-2} = \frac{x^{-12}}{y^8} = \frac{1}{x^{12}y^8}$

36. $\frac{6^{-2}z^{-2}z^3}{3y^0} = \frac{z}{6^2 \cdot 3} = \frac{z}{108}$

Radicals and Rational Expressions

Page 5

$$1. \sqrt{25} = 5$$

$$2. \left(\sqrt[3]{-8}\right)^2 = (-2)^2 = 4$$

$$3. \sqrt{16x^4} = 4x^2$$

$$4. \left(\sqrt[3]{\frac{1}{8}}\right)^{-5} = \left(\frac{1}{2}\right)^{-5} = 2^5$$

$$5. \left(\sqrt{\frac{121}{100}}\right)^{-3} = \left(\frac{11}{10}\right)^{-3} = \left(\frac{10}{11}\right)^3$$

$$6. \left(\sqrt{\frac{4}{9}}\right)^{-3} = \left(\frac{2}{3}\right)^{-3} = \frac{3^3}{2^3}$$

$$7. \left(\sqrt[4]{-81}\right) = \text{not a real number}$$

$$8. \left(\sqrt[3]{27x^6}\right)^2 = (3x^2)^2 = 9x^4$$

$$9. \frac{1}{\left(\sqrt[5]{-32}\right)^4} = \frac{1}{(-2)^4} = -\frac{1}{16}$$

$$10. \sqrt{36r^6} = 6r^3$$

$$11. \left(\sqrt[6]{64a^{12}}\right)^5 = (2a^2)^5 = 32a^{10}$$

$$12. \sqrt[4]{16} = 2$$

$$13. m^{7/3}$$

$$14. 6y^{-5/4}z^{2/3} = \frac{6z^{2/3}}{y^{5/4}}$$

$$15. 4a^{1/2}b^{-7/3} = \frac{4a^{1/2}}{b^{7/3}}$$

$$16. \frac{(x^4y^3z)^{\frac{1}{2}}}{(16x^{-16}yz^5)^{\frac{1}{2}}} = \frac{x^2y^{\frac{3}{2}}z^{\frac{1}{2}}}{4x^{-8}y^{\frac{1}{2}}z^{\frac{5}{2}}} = \frac{x^{10}y}{4z^2}$$

$$17. \left(x^{3/2-1/2}\right)^2 = (x)^2 = x^2$$

$$18. \left(\frac{1}{x^2y}\right)^4 = \frac{1}{x^8y^4}$$

Adding Fractions

Page 6

$$1. \frac{3}{12x} + \frac{4}{12x} = \frac{7}{12x}$$

$$2. \frac{(3x+4)-(2x+5)}{x+2} = \frac{x-1}{x+2}$$

$$3. \frac{z^2}{z} + \frac{1}{z} = \frac{z^2+1}{z}$$

$$4. \frac{15}{24y} - \frac{4}{24y} = \frac{11}{24y}$$

$$5. \frac{2-y}{3(3y+2)} - \frac{y-2}{2(3y+2)} = \frac{2(2-y)}{6(3y+2)} - \frac{3(y-2)}{6(3y+2)} = \frac{(4-2y)-(3y-6)}{6(3y+2)} = \frac{10-5y}{6(3y+2)}$$

$$6. -\frac{3}{(3-2x)} - \frac{2}{(3-2x)(3+2x)} = -\frac{3(3+2x)}{(3-2x)(3+2x)} - \frac{2}{(3-2x)(3+2x)} = \frac{-3(3+2x)-2}{(3-2x)(3+2x)} = \frac{2x-11}{(3-2x)(3+2x)}$$

$$7. \frac{7}{n^2} - \frac{n(5n-2)}{n^2} = \frac{7-n(5n-2)}{n^2} = \frac{-5n^2+2n+7}{n^2}$$

$$8. \frac{3a}{a(a-3)} - \frac{3(a-3)}{a(a-3)} = \frac{3a-3a+9}{a(a-3)} = \frac{9}{a(a-3)}$$

$$9. \frac{2x+3}{2x^2(x-2)} - \frac{1}{x-2} = \frac{2x+3}{2x^2(x-2)} - \frac{2x^2}{2x^2(x-2)} = \frac{-2x^2+2x+3}{2x^2(x-2)}$$

Functions

page 8

$$1. h(2) = \frac{1}{2+9} = \frac{1}{11}$$

$$2. h\left(\frac{1}{a}\right) = \frac{1}{\frac{1}{a}+9} = \frac{a}{1+9a}$$

$$3. h(-x) = \frac{1}{-x+9}$$

$$4. h(\sqrt{a}) = \frac{1}{\sqrt{a}+9}$$

$$5. h(a^2) = \frac{1}{a^2+9}$$

$$6. \frac{1}{h(a)} = \frac{1}{\left(\frac{1}{a+9}\right)} = a+9$$

$$7. \begin{aligned} h(x) &= \frac{1}{13} \\ \frac{1}{x+9} &= \frac{1}{13} \\ x+9 &= 13 \\ x &= 4 \end{aligned}$$

$$8. \begin{aligned} h(x) &= \frac{1}{25} \\ \frac{1}{x+9} &= \frac{1}{25} \\ x+9 &= 25 \\ x &= 16 \end{aligned}$$

$$9. [h(a)]^2 = \left(\frac{1}{a+9}\right)^2 = \frac{1}{(a+9)^2}$$

$$10. f(-2) = 2(-2)^2 = 2 \cdot 4 = 8$$

$$11. \begin{aligned} f(2y) &= 2(2y)^2 \\ &= 2(4y^2) \\ &= 8y^2 \end{aligned}$$

$$12. \begin{aligned} f(6x^2) &= 2(6x^2)^2 \\ &= 2(36x^4) \\ &= 72x^4 \end{aligned}$$

$$13. \begin{aligned} f(-p)+1 &= 2(-p)^2+1 \\ &= 2p^2+1 \end{aligned}$$

$$14. \begin{aligned} f(p+1) &= 2(p+1)^2 \\ &= 2(p^2+2p+1) \\ &= 2p^2+4p+2 \end{aligned}$$

$$15. \begin{aligned} f(p+1)-f(p) &= (2p^2+4p+1)-(2(p)^2) \\ &= 2p^2+4p+1-2p^2 \\ &= 4p+1 \end{aligned}$$

$$16. \begin{aligned} f(a+h) &= 2(a+h)^2 \\ &= 2(a^2+2ah+h^2) \\ &= 2a^2+4ah+2h^2 \end{aligned}$$

$$17. \begin{aligned} f(2+h) &= 2(2+h)^2 \\ &= 2(2+4h+h^2) \\ &= 4+8h+2h^2 \end{aligned}$$

$$18. \begin{aligned} \frac{f(a+h)-f(a)}{h} &= \frac{2(a+h)^2-2a^2}{h} \\ &= \frac{2a^2+4ah+2h^2-2a^2}{h} \\ &= \frac{4ah+2h^2}{h} \\ &= 4a+2h \end{aligned}$$

Logarithms, page 10

1. $3^3 = 27$

4. $\log_3 81 = 4$

7. $4^6 = 64$
 $\log_4 64 = 6$

10. $\log_3 27 = 3$, so
 $3 = 3x + 6$
 $-3 = 3x$
 $x = -1$

13. $\log_4 3 + \log_4 y$

16. $\log_3 5^{1/2} = \frac{1}{2} \log_3 5$

19. $\log_b 2 + \log_b x^2 + \log_b y^3$
 $= \log_b 2 + 2 \log_b x + 3 \log_b y$

22. $\log_b 4\sqrt{x} - \log_b y$
 $= \log_b 4x^{1/2} - \log_b y$
 $= \log_b 4 + \frac{1}{2} \log_b x - \log_b y$

25. $\log_{10} (1 \cdot 100)$
 $= \log_{10} 100$

28. $\log_2 (xy) - \log_2 z$
 $= \log_2 \left(\frac{xy}{z} \right)$

2. $2^{-3} = \frac{1}{8}$

5. $\log_{10} 0.01 = -2$

8. $3^{-2} = \frac{1}{27}$
 $\log_3 \frac{1}{27} = -2$

11. $\log_4 16 = 2$, so
 $2 = 2x - 2$
 $4 = 2x$
 $x = 2$

14. $\log_b x - \log_b z$

17. $\log_3 y^3 + \log_3 z$
 $= 3 \log_3 y + \log_3 z$

20. $4 \log_b (2xy)$
 $= 4 \log_b 2 + 4 \log_b x + 4 \log_b y$

23. $2y \log_b \left(\frac{x}{4} \right)$
 $= 2y \log_b x - 2y \log_b 4$

26. $\log_2 \left(\frac{4}{16} \right)$
 $= \log_2 \left(\frac{1}{4} \right)$

29. $\log_5 x - \log_5 y^{1/5}$
 $= \log_5 \frac{x}{y^{1/5}}$

3. $5^3 = 125$

6. $\log_8 \frac{1}{4} = -\frac{2}{3}$

9. $\log_5 5\sqrt{5} = \log_5 5^{3/2} = \frac{3}{2}$

12. $4^{x/8} = \frac{1}{4}$
 $4^{x/8} = 4^{-1}$
 $\frac{x}{8} = -1$
 $x = -8$

15. $3 \log_6 x$

18. $\log_3 4x^2$
 $= \log_3 4 + \log_3 x^2$
 $= \log_3 4 + 2 \log_3 x$

21. $\log_b x^{3/5}$
 $= \frac{3}{5} \log_b x$

24.
 $\log_b 7x^3y^2 - \log_b \sqrt{z}$
 $= \log_b 7 + \log_b x^3 + \log_b y^2 - \log_b z^{1/2}$
 $= \log_b 7 + 3 \log_b x + 2 \log_b y - \frac{1}{2} \log_b z$

27. $\log_3 3^5 - \log_3 9$
 $= \log_3 \frac{3^5}{9}$
 $= \log_3 27$

30. $\log_3 y + \log_3 (t^4)^4$
 $= \log_3 y + \log_3 t^{16}$
 $= \log_3 (yt^{16})$

Trigonometry
page 14

1. $\sin(\pi) = 0$

4. $\cos\left(\frac{\pi}{2}\right) = 1$

7. $\cos(2\pi) = 1$

10. $\sin\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{2}$

13. $\tan\left(\frac{\pi}{4}\right) = 1$

16. $\cos\left(\frac{3\pi}{2}\right) = 0$

2. $\cos(0) = 1$

5. $\sin\left(-\frac{\pi}{2}\right) = -1$

8. $\tan(0) = 0$

11. $\cos\left(\frac{\pi}{6}\right) = \frac{\sqrt{3}}{2}$

14. $\cos\left(-\frac{\pi}{3}\right) = \frac{1}{2}$

17. $\sin\left(-\frac{\pi}{2}\right) = -1$

3. $\tan(\pi) = 0$

6. $\cos\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{2}$

9. $\tan(\pi) = 0$

12. $\sin\left(\frac{\pi}{3}\right) = \frac{\sqrt{3}}{2}$

15. $\sin\left(-\frac{\pi}{4}\right) = -\frac{\sqrt{2}}{2}$

18. $\sin\left(\frac{\pi}{6}\right) = \frac{1}{2}$

Trigonometry

page 15

$$\begin{aligned}
 1. \quad & \sqrt{1 - \sin^2 \theta} \\
 &= \sqrt{\cos^2 \theta} \\
 &= \cos \theta
 \end{aligned}$$

$$\begin{aligned}
 2. \quad & \tan^2 \theta + 1 \\
 &= \sec^2 \theta
 \end{aligned}$$

$$\begin{aligned}
 3. \quad & \cos x \cdot \tan x \\
 &= \cos x \cdot \frac{\sin x}{\cos x} \\
 &= \sin x
 \end{aligned}$$

$$4. \sin^2 x + \cos^2 x = 1$$

$$\begin{aligned}
 5. \quad & \cos x + \sin x \tan x \\
 &= \cos x + \sin x \frac{\sin x}{\cos x} \\
 &= \frac{\cos^2 x}{\cos x} + \frac{\sin^2 x}{\cos x} \\
 &= \frac{1}{\cos x} \\
 &= \sec x
 \end{aligned}$$

$$\begin{aligned}
 6. \quad & \sec \theta \cos \theta \\
 &= \frac{1}{\cos \theta} \cdot \cos \theta \\
 &= 1
 \end{aligned}$$

7.

$$\begin{aligned}
 & \frac{\cos \theta}{1 - \sin \theta} \cdot \frac{1 + \sin \theta}{1 + \sin \theta} \\
 &= \frac{\cos \theta (1 + \sin \theta)}{1 - \sin^2 \theta} \\
 &= \frac{\cos \theta (1 + \sin \theta)}{\cos^2 \theta} \\
 &= \frac{1 + \sin \theta}{\cos \theta} \\
 &= \sec \theta + \tan \theta
 \end{aligned}$$

$$\begin{aligned}
 8. \quad & \frac{\tan \theta}{1 - \sec^2 \theta} \\
 &= \frac{\tan \theta}{\tan^2 \theta} \\
 &= \frac{1}{\tan \theta} \\
 &= \cot \theta
 \end{aligned}$$

9.

$$\begin{aligned}
 & \frac{2}{\sqrt{1 + \tan^2 x}} \cdot \frac{\sqrt{1 + \tan^2 x}}{\sqrt{1 + \tan^2 x}} \\
 &= \frac{2\sqrt{1 + \tan^2 x}}{1 + \tan^2 x} \\
 &= \frac{2\sqrt{\sec^2 \theta}}{\sec^2 \theta} \\
 &= \frac{2\sec \theta}{\sec^2 \theta}
 \end{aligned}$$

Inverse Trigonometric Functions

page 18

1. $\arcsin(1) = \frac{\pi}{2}$

2. $\arctan(0) = 0$

3. $\arcsin(0) = 0$

4. $\arcsin\left(\frac{\sqrt{2}}{2}\right) = \frac{\pi}{4}$

5. $\arctan\left(\frac{1}{\sqrt{3}}\right) = \frac{\pi}{3}$

6. $\arccos\left(\frac{1}{2}\right) = \frac{\pi}{3}$

7. $\arcsin\left(\frac{1}{2}\right) = \frac{\pi}{6}$

8. $\arcsin\left(-\frac{\sqrt{2}}{2}\right) = -\frac{\pi}{4}$

9. $\arctan(\sqrt{3}) = \frac{\pi}{3}$

Factoring
page 20

1. $(x+5)(x+2)$

4. $(y+5)(y-1)$

7. $6(a-10)(a+2)$

10. $2(x+10)(x+1)$

13. $(3a+4)(3a-4)$

16. $(5x+3y)(5x-3y)$

2. $(x+4)(x+2)$

5. $(x-3)(x-4)$

8. $8(x-8)(x+5)$

11. $(h-8)(h-6)$

14. $(4x+5)(4x-5)$

17. $(2m^2+4)(2m^2-4)$

3. $(x-5)(x+3)$

6. $(x+4)(x+4)$

9. $3y(y+3)(y+1)$

12. $x(x+3)(x+7)$

15. $(x^2+9)(x+3)(x-3)$

18. $(16x+25y)(16x-25y)$

Solving Quadratic Equations

page 21

1. $(x-1)(2x+7)=0$
 $x-1=0$ or $2x+7=0$
 $x=1, -\frac{7}{2}$

4. $(x-4)(x-3)=0$
 $x-4=0$ or $x-3=0$
 $x=4, 3$

7. $(x-4)(x-1)=0$
 $x-4=0$ or $x-1=0$
 $x=1, 4$

10. $5x(x^2-4)=0$
 $5x(x+2)(x-2)=0$
 $5x=0$ or $x+2=0$ or $x-2=0$
 $x=0, -2, 2$

2. $5(x-2)(x-3)=0$
 $x-2=0$ or $x-3=0$
 $x=2, 3$

5. $2(x^2+9x+1)=0$

$$x = \frac{-9 \pm \sqrt{(-9)^2 - 4 \cdot 1 \cdot 1}}{2 \cdot 1}$$

$$x = \frac{-9 + \sqrt{77}}{2}, \frac{-9 - \sqrt{77}}{2}$$

8. $x = \frac{3 \pm \sqrt{(-3)^2 - 4 \cdot 5 \cdot (-6)}}{2 \cdot 5}$

$$x = \frac{3 \pm \sqrt{129}}{10}$$

$$x = \frac{3 + \sqrt{129}}{10}, \frac{3 - \sqrt{129}}{10}$$

11. $\frac{3}{2}x(x^2-4)=0$
 $\frac{3}{2}x(x+2)(x-2)=0$
 $\frac{3}{2}x=0$ or $x+2=0$ or $x-2=0$
 $x=0, -2, 2$

3. $8x(x+2)(x-2)=0$
 $8x=0$ or $x+2=0$ or $x-2=0$
 $x=0, -2, 2$

6. $x(x+2)(x+1)=0$
 $x=0$ or $x+2=0$ or $x+1=0$
 $x=0, -2, -1$

9. $x(x+2)(x+1)=0$
 $x=0$ or $x+2=0$ or $x+1=0$
 $x=0, -2, -1$

12. $x = \frac{-9 \pm \sqrt{9^2 - 4(-3)(10)}}{2(-3)}$

$$x = \frac{-9 \pm \sqrt{201}}{-6}$$

$$x = \frac{9 - \sqrt{201}}{6}, \frac{9 + \sqrt{201}}{6}$$

Equations of Lines

page 22

$$1. m = \frac{7-5}{-4-2} = \frac{2}{-6} = -\frac{1}{3}$$

$$2. m = \frac{-2-6}{5-0} = \frac{-8}{5} = -\frac{8}{5}$$

$$3. m = \frac{12-4}{3-3} = \frac{8}{0} = \text{undefined}$$

$$4. y - (-4) = -\frac{1}{2}(x-3)$$

$$y + 4 = -\frac{1}{2}x + \frac{3}{2}$$

$$y = -\frac{1}{2}x - \frac{5}{2}$$

$$5. m = \frac{2-7}{-5-0} = \frac{-5}{-5} = 1 \quad y - 7 = 1(x-0)$$

$$y = x + 7$$

$$6. m = \frac{6-6}{9-(-2)} = 0 \quad y - 6 = 0(x-9)$$

$$y = 6$$

$$7. y - (-2) = \frac{2}{3}(x-0)$$

$$y + 2 = \frac{2}{3}x$$

$$y = \frac{2}{3}x - 2$$