ALGEBRA 1 W/ QUADRATIC EMPHASIS – FINAL EXAM REVIEW Name Answer Key

Chapter 7 – Exponents and Exponential Functions

7.1 – Zero and Negative Exponents
7.2 – Multiplying Powers with the Same Base
7.3 – More Multiplication Properties of Exponents
7.4 – Division Properties of Exponents
7.6 – Exponential Functions
7.7 – Exponential Growth and Decay

CHAPTER 7 HOMEWORK: pg 479 #1-5, 14-18, 20

Simplify each expression. Use positive exponents.

1. $(x^6)^5$

x^{30}

2. $(7x^4)(5x^{-7})$

$35x^{-3}$

$\frac{35}{x^3}$

3. 5^0

1

4. $(2x^5)(4x^5)(2y^3)$

$16x^{10}y^3$

5. $\frac{5x^{-3}}{x^2} = \frac{5}{x^2x^3}$

$\frac{5}{x^5}$

6. $(x^5y^4)(x^2y)$

x^7y^5

7. $(2x^2y^4z^5)^3$

$8x^6y^{12}z^{15}$

8. $\frac{5}{x^{-3}}$

$5x^3$

9. $\frac{12x^3y^{-4}z^3}{12x^{-4}yz^{-2}}$

$\frac{x^7z^5}{4y^5}$

10. $\left(\frac{x^4yz}{x^{-3}y^5z^{-2}}\right)^0$

1

11. $(2x^3)^3(3x^3)^2$

$(8x^9)(9x^6)$

$72x^{15}$

12. $\left(\frac{2}{3}\right)^{-2}$

$\left(\frac{3}{2}\right)^2$

$\frac{9}{4}$

Evaluate each function for x = -1, 1, and 3.

13. $f(x) = 3 \bullet 5^x$

$f(-1) = 3 \cdot 5^{-1} = 3 \cdot \frac{1}{5} = \frac{3}{5}$

$f(1) = 3 \cdot 5^1 = 3 \cdot 5 = 15$

$f(3) = 3 \cdot 5^3 = 3 \cdot 125 = 375$

$f(-1) = \frac{3}{5}$ $f(1) = 15$ $f(3) = 375$

14. $f(x) = \frac{1}{4} \bullet 2^x$

$f(-1) = \frac{1}{4} \cdot 2^{-1} = \frac{1}{4} \cdot \frac{1}{2} = \frac{1}{8}$

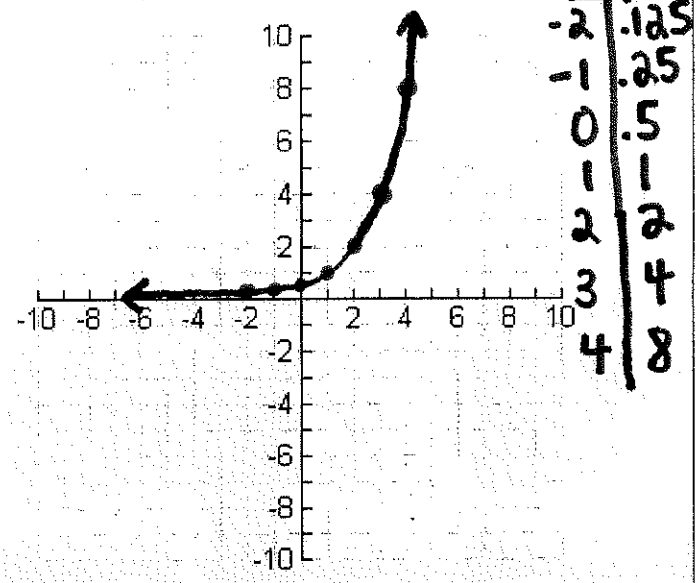
$f(1) = \frac{1}{2} \cdot 2 = \frac{1}{4} \cdot \frac{2}{1} = \frac{2}{4} = \frac{1}{2}$

$f(3) = \frac{1}{4} \cdot 2^3 = \frac{1}{4} \cdot \frac{8}{1} = \frac{8}{4} = 2$

$f(-1) = \frac{1}{8}$ $f(1) = \frac{1}{2}$ $f(3) = 2$

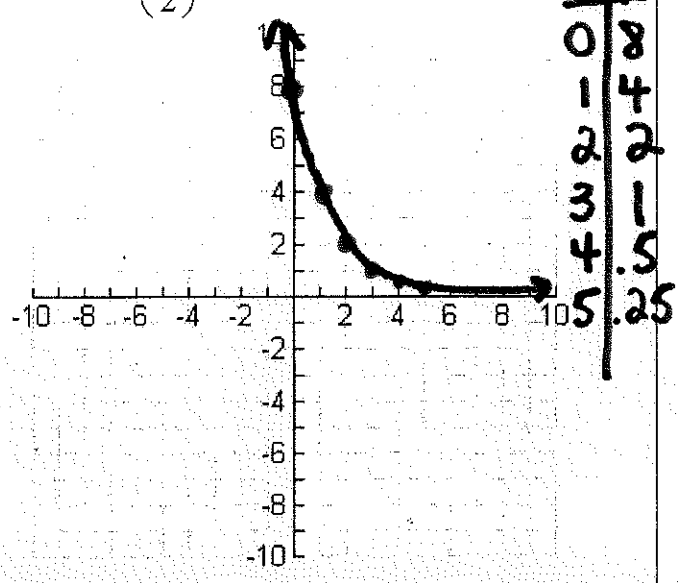
Graph each function. Plot as many points as you can on the graph provided.

15. $f(x) = \frac{1}{2} \cdot 2^x$



x	y
-2	.125
-1	.25
0	.5
1	1
2	2
3	4
4	8

16. $f(x) = 8 \cdot \left(\frac{1}{2}\right)^x$



x	y
0	8
1	4
2	2
3	1
4	.5
5	.25

17. A population of 2000 fish increases at an annual rate of 7.5%. How many fish will there be in 10 years?

$y = 2000(1+.075)^x$

$y = 2000(1.075)^{10}$

≈ 4122 fish

18. The function $y = 41 \cdot 0.95^x$ models the difference (in minutes) between men's and women's finishing times for the Boston Marathon. The number of years since women first officially ran the race in 1972 is represented by x.

Does the exponential function represent growth or decay?

decay $(.95 < 1)$

Estimate the difference between finishing times in 1990?

$y = 41 \cdot .95^{18}$ 16.29 min

Predict the difference between finishing times in 2015.

$y = 41 \cdot .95^{43}$ 4.52 min

19. Suppose you deposit $2000 in a savings account that pays 5.3% interest compounded annually. How much will you have in your account after 8 years?

$A = P(1+r)^t$

$A = 2000(1+.053)^8$

$3023.13

20. Suppose you deposit $1525 in an investment account that pays 3.25% interest compounded annually. How many more years will it take until you have over $2500 in your account?

$A = 1525(1+.0325)^t$

$A = 1525(1.0325)^t$

16 years

Chapter 8 – Polynomials and Factoring

8.1 – Adding and Subtracting Polynomials
8.2 – Multiplying and Factoring
8.3 – Multiplying Binomials
8.4 – Multiplying Special Cases
8.5 – Factoring $x^2 + bx + c$
8.6 – Factoring $ax^2 + bx + c$
8.7 – Factoring Special Cases

CHAPTER 8 HOMEWORK: pg 539 #1-20, 25

Simplify each sum or difference.

1. $(5x^4 - 3x^3 + 5x^2 - 5) + (2x^3 - 3x^2)$

$5x^4 - x^3 + 2x^2 - 5$

2. $(2x - 12x^2 - 2) - (x^2 + 4x - 1)$

$2x - 12x^2 - 2 - x^2 - 4x + 1$

$-13x^2 - 2x - 1$

3. $(2x^2 - 1) - (3x^2 + 5x + 7)$

$2x^2 - 1 - 3x^2 - 5x - 7$

$-x^2 - 5x - 8$

4. $(8x^2 - 3x + 1) + (4x^2 + 5x - 3)$

$12x^2 + 2x - 2$

Multiply

5. $2x^2(x^4 - 3x^3)$

$2x^6 - 6x^5$

6. $(x + 1)(2x - 3)$

$2x^2 - 3x + 2x - 3$

$2x^2 - x - 3$

7. $(4x + 1)(4x - 1)$

$16x^2 - 4x + 4x - 1$

$16x^2 - 1$

8. $(x - 1)(x^2 + 5x - 3)$

$x^3 + 5x^2 - 3x - x^2 - 5x + 3$

$x^3 + 4x^2 - 8x + 3$

9. $(2x - 3)(4x + 9)$

$8x^2 + 18x - 12x - 27$

$8x^2 + 6x - 27$

10. $(3x + 1)^2$

$(3x + 1)(3x + 1)$

$9x^2 + 3x + 3x + 1$

$9x^2 + 6x + 1$

Factor each polynomial.

11. $24x-9$

$3(8x-3)$

12. $24x^3-40x^2+72x$

$8x(3x^2-5x+9)$

$8x(3x$ [illegible]

13. $9x^2-100$

$(3x+10)(3x-10)$

14. $x^2-11x+28$

$(x-7)(x-4)$

15. $49a^2-56a+16$

[illegible]

$(7a-4)(7a-4)$

16. $m^2+2m-35$

$(m+7)(m-5)$

17. $8h^2+36h+16$

$4(2h^2+9h+4)$

$4(2h+1)(h+4)$

18. $3x^2-13x+12$

$(3x-4)(x-3)$

19. $8x^2+60x+72$

$4(2x^2+15x+18)$

$4(2x+3)(x+6)$

20. The area of a rectangular coffee table is given by the trinomial x^2+7x-8. The table's length is $(x+8)$. What is the table's width?

$x^2+7x-8=(x+8)(x-1)$

area = length · width

$x-1$

21. If the perimeter of a quadrilateral is represented by $15x+3$ and three of the sides are represented by $2x-1$, $3x+5$, and $4x+3$, what is the length of the fourth side of the quadrilateral?

$15x+3=(2x-1)+(3x+5)+(4x+3)+?$

$15x+3=9x+7+?$

$6x-4$

Chapter 9 – Quadratic Functions and Equations

9.1 – Quadratic Graphs and Their Properties
9.2 – Quadratic Functions
9.3 – Solving Quadratic Equations
9.4 – Factoring to Solve Quadratic Equations
9.5 – Completing the Square
9.6 – The Quadratic Formula and the Discriminant
9.7 – Linear, Quadratic, and Exponential Models
9.8 – Systems of Linear and Quadratic Equations

CHAPTER 9 HOMEWORK: pg 607 #1-22

$x = \frac{-b}{2a}$

Find the equation of the axis of symmetry and the coordinates of the vertex of the graph of each function.

1. $y = x^2 + 6x - 9$ $x = \frac{-6}{2(1)} = -3$
A.O.S: $x = -3$
$y = (-3)^2 + 6(-3) - 9 = -18$
Vertex: $(-3, -18)$

2. $y = -4x^2 + 3$ $x = \frac{-0}{2(-4)} = 0$
A.O.S: $x = 0$
$y = -4(0)^2 + 3 = 3$
Vertex: $(0, 3)$

3. $y = x^2 + 7x + 10$ $x = \frac{-7}{2(1)} = -\frac{7}{2}$
A.O.S $x = -3.5$
$y = (-3.5)^2 + 7(3.5) + 10 = -2.25$
Vertex: $(-3.5, -2.25)$

Graph each function. Plot as many points fit on the graph provided and fill in the missing information.

4. $y = -x^2 + 7x - 10$

A.) Coordinates of the vertex: $(3.5, 2.25)$

B.) Coordinates of the y-intercept: $(0, -10)$

C.) Coordinates of the x intercept(s) (zeros): $(5,0), (2,0)$

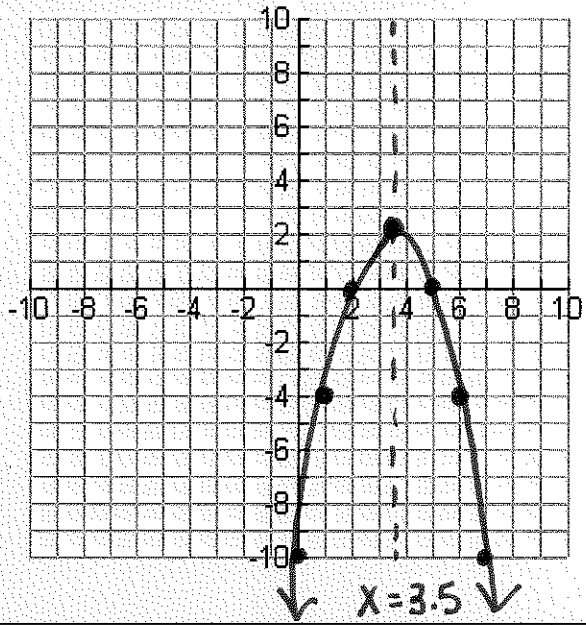
$0 = -(x^2 - 7x + 10) = -1(x-5)(x-2)$

D.) Equation of the axis of symmetry: $x = 3.5$

$x = \frac{-7}{2(-1)} = 3.5$

E.) Domain: $\mathbb{R}$

F.) Range: $y \leq 2.25$



5. $y = -4x^2 + 3$

A.) Coordinates of the vertex: $(0, 3)$

B.) Coordinates of the y-intercept: $(0, 3)$

C.) Coordinates of the x intercept(s) (zeros): $\left(\frac{\sqrt{3}}{2}, 0\right), \left(-\frac{\sqrt{3}}{2}, 0\right)$

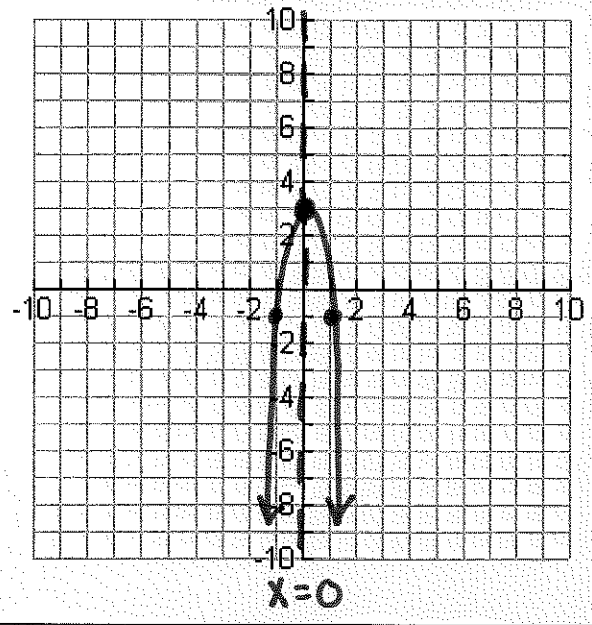
$0 = -4x^2 + 3 \Rightarrow x = \pm\frac{\sqrt{12}}{2}$

D.) Equation of the axis of symmetry: $x = 0$

$x = \frac{-0}{2(-4)} = 0$

G.) Domain: $\mathbb{R}$

H.) Range: $y \leq 3$



Solve the system of equations.

6.) $y = 2x^2 - 3$, $y = 3x - 1$

$3x - 1 = 2x^2 - 3$

$0 = 2x^2 - 3x - 2$

$0 = (2x+1)(x-2)$

$x = -\frac{1}{2}$ $\quad x = 2$

$y = -2.5$ $\quad y = 5$

$(-.5, -2.5)$ $\quad (2, 5)$

7.) $y = x^2 - x + 2$, $y = x + 5$

$x + 5 = x^2 - x + 2$

$0 = x^2 - 2x - 3$

$0 = (x-3)(x+1)$

$x = 3$ $\quad x = -1$

$y = 8$ $\quad y = 4$

$(3, 8)$ $\quad (-1, 4)$

Find the number of real-number solutions of each equation. $b^2 - 4ac$

8.) $0 = 4x^2 + 9$

$a = 4$, $b = 0$, $c = 9$

$0^2 - 4(4)(9) = -144$

no real solutions

9.) $0 = 3x^2 + x - 4$

$a = 3$, $b = 1$, $c = -4$

$1^2 - 4(3)(-4) = 49$

two real solutions

10.) $0 = x^2 - 6x + 9$

$a = 1$, $b = -6$, $c = 9$

$(-6)^2 - 4(1)(9) = 0$

one real solution

Find the value of n such that each expression is a perfect square trinomial. $\left(\frac{b}{2}\right)^2$

11.) $p^2 + 10p + n$

$\left(\frac{10}{2}\right)^2 = 25$

12.) $y^2 - 60y + n$

$\left(\frac{-60}{2}\right)^2 = 900$

13.) $x^2 - 14x + n$

$\left(\frac{-14}{2}\right)^2 = 49$

Solve each equation by completing the square. If necessary, round to the nearest hundredth.

14.) $x^2 - 18x = 19$

$+81 \quad +81$

$x^2 - 18x + 81 = 100$

$\sqrt{(x-9)^2} = \sqrt{100}$

$x - 9 = \pm 10$

$+9 \quad +9$

$x = 10 + 9 = 19$

$x = -10 + 9 = -1$

$x = 19, -1$

15.) $x^2 + 6x = 16$

$+9 \quad +9$

$x^2 + 6x + 9 = 25$

$\sqrt{(x+3)^2} = \sqrt{25}$

$x + 3 = \pm 5$

$-3 \quad -3$

$x = 5 - 3 = 2$

$x = -5 - 3 = -8$

$x = 2, -8$

Solve each equation by using square roots.

16.) $x^2 - 121 = 0$

$\sqrt{x^2} = \sqrt{121}$

$x = \pm 11$

17.) $5x^2 - 245 = 0$

$\frac{5x^2}{5} = \frac{245}{5}$

$\sqrt{x^2} = \sqrt{49}$

$x = \pm 7$

Solve each equation by using the quadratic formula. If necessary, round to the nearest hundredth.

18.) $x^2-4x-7=0$ $a=1$ $b=-4$ $c=-7$

$$x=\frac{4\pm\sqrt{(-4)^2-4(1)(7)}}{2(1)}=\frac{4\pm\sqrt{44}}{2}$$

$x=5.32, -1.32$

19.) $2x^2-5x-12=0$ $a=2$ $b=-5$ $c=-12$

$$x=\frac{5\pm\sqrt{(-5)^2-4(2)(-12)}}{2(2)}$$

$$x=\frac{5\pm\sqrt{121}}{4}=\frac{5\pm11}{4}$$

$x=4$
$x=-1.5$

Solve each equation by using factoring.

20.) $2x^2-9x-5=0$ -10

$2x^2-10x+1x-5=0$

$2x(x-5)+1(x-5)=0$

$(2x+1)(x-5)=0$

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

21.) $x^2-7x=-12$

$x^2-7x+12=0$

$(x-4)(x-3)=0$

$x=4$
$x=3$

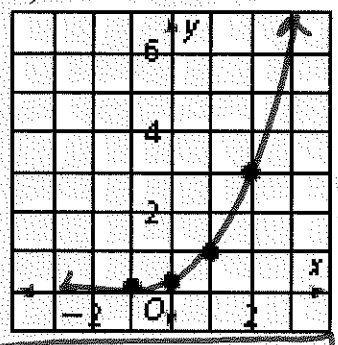
Which model (linear, exponential, or quadratic) is most appropriate for the data shown in the graph or table?

22.)

x	y	
0	5	+2
1	7	+2
2	9	+2
3	11	+2
4	13	

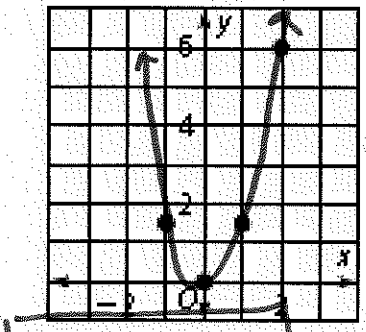
linear

23.)



Exponential

24.)



Quadratic

25.) A squirrel drops an acorn from a tree that is 35feet high. The height of the acorn can be modeled by $h=-16t^2+35$, where h is the height in feet and t is the time in seconds. Estimate the amount of time it takes for the acorn to hit the ground. Round to the nearest hundredth of a second.

$0=-16t^2+35$

$-35 \quad -35$

$\frac{-35}{-16}=\frac{-16t^2}{-16}$

$\sqrt{\frac{35}{16}}=\sqrt{t^2}$

$t=1.48$ sec

26.) A ball is thrown into the air with an initial upward velocity of 60 ft/s. Its height h in feet after t seconds is given by the function $h=-16t^2+60t+6$. use calc.

After how many seconds will the ball hit the ground?

3.85 sec

What is the maximum height of the ball?

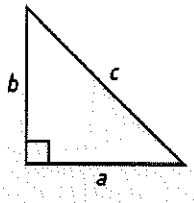
62.25 ft

Chapter 10 – Radical Expressions and Equations

10.1 – Pythagorean Theorem
10.2 – Simplifying Radicals
10.3 – Operations with Radical Expressions
10.4 – Solving Radical Equations

CHAPTER 10 HOMEWORK: pg 657 #1-21, 25-26

Use the triangle at the right. Find the length of the missing side.



1. a = 16, b = 63

$16^2+63^2=c^2$
$4225=c^2$
$c=65$

2. b = 2.1, c = 2.9

$a^2+2.1^2=2.9^2$
$a^2+4.41=8.41$
$a^2=4$
$a=2$

3. a = 65, c = 97

$65^2+b^2=97^2$
$4225+b^2=9409$
$b^2=5184$
$b=72$

4. a = 6, b = 8

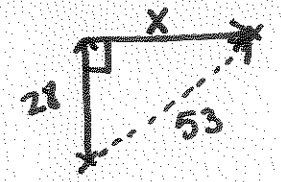
$6^2+8^2=c^2$
$100=c^2$
$c=10$

5. A side of a Rubik's cube has a surface area of 224 square millimeters. What is the length of each side of the Rubik's cube in simplified radical form?

224 = x

$\sqrt{x^2}=\sqrt{224}$
$x=\sqrt{16}\sqrt{14}$
$x=4\sqrt{14}$ mm

6. A car travels 28 miles north and then turns east. How far did the car travel east if the destination is 53 miles from the starting point?



$x^2+28^2=53^2$
$x^2+784=2809$
$x^2=2025$
$x=45$ miles

Determine whether the given lengths can be the side lengths of a right triangle.

7. 60 km, 91 km, 109 km

$60^2+91^2=109^2$
yes

8. 39 mm, 80 mm, 89 mm

$39^2+80^2=89^2$
yes

9. 18 ft, 85 ft, 87 ft

$18^2+85^2\neq 87^2$
NO

Simplify each radical expression.

10. $\sqrt{150}$

$\sqrt{25}\cdot\sqrt{6} = 5\sqrt{6}$

11. $\sqrt{45n^4}$

$\sqrt{9}\sqrt{5}\sqrt{n^4} = 3n^2\sqrt{5}$

12. $\sqrt{72}$

$\sqrt{36}\cdot\sqrt{2}$

$6\sqrt{2}$

13. $3\sqrt{7}+8\sqrt{7}$

$11\sqrt{7}$

14. $14\sqrt{5}-10\sqrt{5}$

$4\sqrt{5}$

15. $4\sqrt{2}-3\sqrt{18}$

$\sqrt{9}\cdot\sqrt{2}$

$4\sqrt{2}-9\sqrt{2}$

$-5\sqrt{2}$

16. $25\sqrt{7}-2\sqrt{63}$

$\sqrt{9}\cdot\sqrt{7}$

$25\sqrt{7}-6\sqrt{7}$

$19\sqrt{7}$

17. $4\sqrt{54}-3\sqrt{150}$

$\sqrt{36}\sqrt{6}$ $\sqrt{25}\sqrt{6}$

$12\sqrt{6}-15\sqrt{6}$

$-3\sqrt{6}$

18. $2\sqrt{18}$

$\sqrt{9}\sqrt{2}$

$6\sqrt{2}$

19. $\sqrt{243}$

$\sqrt{81}\sqrt{3}$

$9\sqrt{3}$

20. $\sqrt{\frac{25}{81}}$ $\frac{5}{9}$

21. $2\sqrt{3x}\cdot 3\sqrt{6x}$

$6\sqrt{18x^2}$

$6\cdot\sqrt{9}\sqrt{2}\sqrt{x^2}$

$18x\sqrt{2}$

Solve each radical equation. Check your solution.

22. $\sqrt{3c}+5=-7$

$-5 \quad -5$

$(\sqrt{3c})^2=(-12)^2$

$3c=144$

$c=48$ extraneous

no solution

23. $(\sqrt{2x+3})^2=(\sqrt{6x-1})^2$

$2x+3=6x-1$

$-2x+1 \quad -2x+1$

$4=4x$

$x=1$ ✓

24. $(\sqrt{3x-2})^2=(x)^2$

$3x-2=x^2$

$-3x+2 \quad -3x+2$

$0=x^2-3x+2$

$0=(x-2)(x-1)$

$x=2$ ✓ $x=1$ ✓

25. $\sqrt{x}+4=16$

$-4 \quad -4$

$(\sqrt{x})^2=(12)^2$

$x=144$ ✓

Chapter 11 – Rational Expressions and Functions

11.1 – Simplifying Rational Expressions
11.2 – Multiplying and Dividing Rational Expressions
~~11.3 – Dividing Polynomials~~
11.4 – Adding and Subtracting Rational Expressions
11.5 – Solving Rational Equations

CHAPTER 11 HOMEWORK: pg 719 #8-12, 14-19

Simplify each expression. State any excluded values.

1. $\frac{6x-48}{2x-16} = \frac{6(x-8)}{2(x-8)} = \frac{6}{2}$

$3 \quad x \neq 8$

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

$\frac{3a-1}{a-1} \quad a \neq 1, -1$

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

$\frac{1}{x+1} \quad x \neq -4, -1$

4. $\frac{2x-6}{4x-12} = \frac{2(x-3)}{4(x-3)}$

$\frac{1}{2} \quad x \neq 3$

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

$\frac{2}{a-1} \quad a \neq 1, -1$

6. $\frac{x^2-3x-10}{x^2-4} \quad \frac{(x-5)(x+2)}{(x+2)(x-2)}$

$\frac{x-5}{x-2} \quad x \neq -2, 2$

Multiply or divide.

7. $\frac{2x+4}{x+2} \cdot \frac{3x}{4x+1} = \frac{2(x+2)}{x+2} \cdot \frac{3x}{4x+1}$

$\frac{6x}{4x+1}$

8. $\frac{2n-1}{n^2-4} \div \frac{n^2}{n+2} = \frac{2n-1}{n^2-4} \cdot \frac{n+2}{n^2}$

$\frac{2n-1}{(n-2)(n+2)} \cdot \frac{n+2}{n^2}$

$\frac{2n-1}{n^2(n-2)}$

9. $\frac{4a^2+4a-3}{2a+3} \div \frac{2a-1}{a}$

$\frac{4a^2+4a-3}{2a+3} \cdot \frac{a}{2a-1}$

$\frac{(2a+3)(2a-1)}{2a+3} \cdot \frac{a}{2a-1}$

a

Add or subtract.

10. $\frac{3}{2a} + \frac{5}{2a} = \frac{8}{2a}$

$\frac{4}{a}$

11. $\frac{6}{b-1} - \frac{7}{b-1}$

$\frac{-1}{b-1}$

12. $\frac{x^2-1}{x^2-x-2} - \frac{x-1}{x-2}$

$\frac{x^2-1}{(x-2)(x+1)} - \frac{x-1}{x-2}\frac{(x+1)}{(x+1)}$

$\frac{x^2-1}{(x-2)(x+1)} - \frac{(x^2-1)}{(x-2)(x+1)}$

0

13. $\frac{5}{x} + \frac{3}{x-1}$

$\frac{5x-5}{x(x-1)} + \frac{3x}{x(x-1)}$

$\boxed{\frac{8x-5}{x(x-1)}}$

14. $\frac{4}{m} - \frac{1}{2-m}$

$\frac{8-4m}{m(2-m)} - \frac{m}{m(2-m)}$

$\boxed{\frac{8-5m}{m(2-m)}}$

15. $\frac{3-d}{d} - \frac{d+4}{2d}$

$\frac{6-2d}{2d} - \frac{(d+4)}{2d}$

$\boxed{\frac{-3d+2}{2d}}$

Solve each equation/word problem. Check your solutions.

16. $\frac{y}{y}\cdot\frac{1}{5} + \frac{2}{y}\cdot\frac{5}{5} = \frac{1}{1}\cdot\frac{5y}{5y}$

$\frac{y}{5y} + \frac{10}{5y} = \frac{5y}{5y}$

$y + 10 = 5y$

$10 = 4y$

$\frac{10}{4} = y$

$\boxed{y = \frac{5}{2}}$

17. $\frac{x^2}{x} = \frac{9}{1}$

$x^2 = 9$

$\boxed{x = \pm 3}$

18. $\frac{d}{d-1} = \frac{4d}{3d-2}$

$d(3d-2) = 4d(d-1)$

$3d^2 - 2d = 4d^2 - 4d$

$0 = d^2 - 2d$

$0 = d(d-2)$

$\boxed{d = 0, 2}$

19. $\frac{6x}{x-4} = 14(x-4)$

$6x = 14x - 56$

$-8x = -56$

$\boxed{x = 7}$

20. y varies inversely with x and y = 11 when x = 9. What is the value of y when x = 3.

$y = \frac{k}{x}$

$11 = \frac{k}{9}$

$k = 99 \Rightarrow y = \frac{99}{x}$

$y = \frac{99}{3}$

$\boxed{y = 33}$

21. It takes Jalen 5 hours to decorate the gym for Homecoming. Grace can decorate the gym in 4 hours while David takes 7 hours. How long will it take for them if they decorate the gym together?

$\frac{1}{5} + \frac{1}{4} + \frac{1}{7} = \frac{1}{x}$ (LCD = 140)

$\frac{28x}{140x} + \frac{35x}{140x} + \frac{20x}{140x} = \frac{140}{140x}$

$83x = 140$

$\boxed{x \approx 1.69 \text{ hours}}$