Algebra 1

Our Goal: To learn about properties of square roots

Warm Up: simplifying square roots

Today's Homework:
9.1 Textbook Exercises, p.485-486:
14-28 (evens), 40-60 (multiples of 4), and 75, 80
(that's 14,16,18,20,22,24,26,28,40,44,48,52,56,60,75,80)

iready due Friday, if needed

Previous Homework
None

$\pm\sqrt{100}$ $\quad \sqrt{120}$

$\sqrt{100} < \sqrt{120} < \sqrt{121}$

$10 < \sqrt{120} < 11$

$\sqrt{120} = \sqrt{4}\sqrt{30}$

$= 2\sqrt{30}$

5.4772

Simplify.

1. $\sqrt{16}$

2. $\sqrt{64}$

3. $\sqrt{225}$

4. $\sqrt{2025}$

5. $\sqrt{57,600}$

6. $\sqrt{36}$

7. $\sqrt{400}$

8. $\sqrt{4}$

9. $\sqrt{3600}$

Determine whether the function represents *exponential growth* or *exponential decay*. Identify the percent rate of change.

1. $y = 5(0.7)^t$

2. $y = 49(1.04)^t$

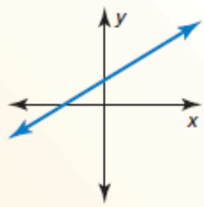
3. $r(t) = 0.5(0.95)^t$

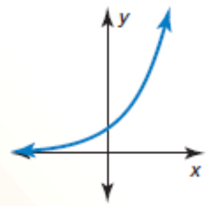
4. $g(t) = 3\left(\frac{4}{5}\right)^t$

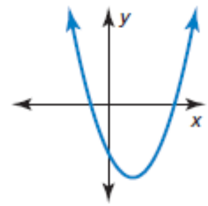
Core Concept

Linear, Exponential, and Quadratic Functions

Linear Function	Exponential Function	Quadratic Function
$y = mx + b$	$y = ab^x$	$y = ax^2 + bx + c$







Core Concept

Differences and Ratios of Functions

You can use patterns between consecutive data pairs to determine which type of function models the data. The differences of consecutive y-values are called *first differences*. The differences of consecutive first differences are called *second differences*.

- **Linear Function** The first differences are constant.
- **Exponential Function** Consecutive y-values have a common *ratio*.
- **Quadratic Function** The second differences are constant.

In all cases, the differences of consecutive x-values need to be constant.

Tell whether each table of values represents a *linear*, an *exponential*, or a *quadratic* function.

a.

x	-3	-2	-1	0	1
y	11	8	5	2	-1

b.

x	-2	-1	0	1	2
y	1	2	4	8	16

c.

x	-2	-1	0	1	2
y	-1	-2	-1	2	7

Core Concept

Product Property of Square Roots

Words The square root of a product equals the product of the square roots of the factors.

Numbers $\sqrt{9 \cdot 5} = \sqrt{9} \cdot \sqrt{5} = 3\sqrt{5}$

Algebra $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$, where $a, b \geq 0$

Simplify the square roots.

$\sqrt{49}$ $\sqrt{50}$

Simplify the expression.

1. $\sqrt{24}$ **2.** $-\sqrt{80}$ **3.** $\sqrt{49x^3}$ **4.** $\sqrt{75n^5}$

Core Concept

Quotient Property of Square Roots

Words The square root of a quotient equals the quotient of the square roots of the numerator and denominator.

Numbers $\sqrt{\frac{3}{4}} = \frac{\sqrt{3}}{\sqrt{4}} = \frac{\sqrt{3}}{2}$ **Algebra** $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$, where $a \geq 0$ and $b > 0$

Simplify the expression.

5. $\sqrt{\frac{23}{9}}$

6. $-\sqrt{\frac{17}{100}}$

7. $\sqrt{\frac{36}{z^2}}$

8. $\sqrt{\frac{4x^2}{64}}$

9. $\sqrt[3]{54}$

10. $\sqrt[3]{16x^4}$

11. $\sqrt[3]{\frac{a}{-27}}$

12. $\sqrt[3]{\frac{25c^7d^3}{64}}$

Simplify $\frac{7}{2-\sqrt{3}}$.

$\sqrt{8}$

$\sqrt{4}\sqrt{2}$

$2\sqrt{2}$

$\sqrt{20}$

$2\sqrt{5}$

$$\sqrt{\frac{1}{2}} = \frac{\sqrt{1}}{\sqrt{2}} = \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

$$\sqrt{\frac{2}{3}} \quad \frac{\sqrt{2}}{\sqrt{3}} \quad \frac{\sqrt{2}\sqrt{3}}{\sqrt{3}\sqrt{3}} \quad \frac{\sqrt{6}}{\sqrt{9}} \quad \frac{\sqrt{6}}{3}$$

$$\frac{1}{1+\sqrt{2}} \cdot \frac{1-\sqrt{2}}{1-\sqrt{2}}$$

$$\frac{1-\sqrt{2}}{(1+\sqrt{2})(1-\sqrt{2})} =$$

$$\frac{1-\sqrt{2}}{1-\cancel{\sqrt{2}}+\cancel{\sqrt{2}}-2} = \frac{1-\sqrt{2}}{-1}$$

$$= -1+\sqrt{2}$$

$$\frac{8}{(\sqrt{3}-1)}\cdot\frac{(\sqrt{3}+1)}{(\sqrt{3}+1)}$$

$$(\sqrt{3})^2 \cancel{+\sqrt{3}} \cancel{-\sqrt{3}} - 1^2$$

$$\frac{8 \div 2\sqrt{3} + 8 \div 2}{2 \div 2} = 4\sqrt{3}+4$$

$$\frac{\overset{4}{\cancel{8}}\sqrt{3}+1}{\cancel{2}}$$

$$\frac{\overset{4}{\cancel{8}}+1}{\cancel{2}}$$

Simplify the expression.

13. $\dfrac{1}{\sqrt{5}}$ **14.** $\dfrac{\sqrt{10}}{\sqrt{3}}$ **15.** $\dfrac{7}{\sqrt{2x}}$ **16.** $\sqrt{\dfrac{2y^2}{3}}$

17. $\dfrac{5}{\sqrt[3]{32}}$ **18.** $\dfrac{8}{1+\sqrt{3}}$ **19.** $\dfrac{\sqrt{13}}{\sqrt{5}-2}$ **20.** $\dfrac{12}{\sqrt{2}+\sqrt{7}}$

The ratio of the length to the width of a *golden rectangle* is $\left(1+\sqrt{5}\right)$: 2. The dimensions of the face of the Parthenon in Greece form a golden rectangle. What is the height *h* of the Parthenon?

Simplify $\sqrt{5}\left(\sqrt{3}-\sqrt{75}\right)$.

$\sqrt{5}\sqrt{3}-\sqrt{5}\cdot\sqrt{75}$

$\sqrt{15}-\sqrt{5}\sqrt{25}\sqrt{3}$

$1\sqrt{15}-5\sqrt{15}$

$-4\sqrt{15}$

$x-5x$

$-4x$

$\sqrt{8}+\sqrt{\frac{1}{2}}-\sqrt{2}$

$2\sqrt{2}+\frac{\sqrt{1}}{\sqrt{2}}\cdot\frac{\sqrt{2}}{\sqrt{2}}-\sqrt{2}$

$2\sqrt{2}+\frac{\sqrt{2}}{2}-\sqrt{2}$

$\sqrt{2}\left(2+\frac{1}{2}-1\right)$

$\frac{3\sqrt{2}}{2}$

$1\frac{1}{2}$

$1+\frac{1}{2}$

Simplify $\sqrt{5} - 5\sqrt{13} - 8\sqrt{5}$

$$\underbrace{\sqrt{5} - 8\sqrt{5}} - 5\sqrt{13}$$

$$-7\sqrt{5} - 5\sqrt{13}$$

Simplify the expression.

23. $3\sqrt{2} - \sqrt{6} + 10\sqrt{2}$

$3\sqrt{2} + 10\sqrt{2} - \sqrt{6}$

$13\sqrt{2} - \sqrt{6}$

24. $4\sqrt{7} - 6\sqrt{63}$

25. $4\sqrt[3]{5x} - 11\sqrt[3]{5x}$

26. $\sqrt{3}\left(8\sqrt{2} + 7\sqrt{32}\right)$ $16 \cdot 6$

$8\sqrt{6} + 7\sqrt{96}$

$8\sqrt{6} + 7\sqrt{8}\sqrt{12}$

$7\sqrt{4}\sqrt{2}\sqrt{4}\sqrt{3}$

$7 \cdot 2 \cdot 2\sqrt{6}$

$8\sqrt{6} + 28\sqrt{6}$

$36\sqrt{6}$

27. $\left(2\sqrt{5} - 4\right)^2$

28. $\sqrt[3]{-4}\left(\sqrt[3]{2} - \sqrt[3]{16}\right)$

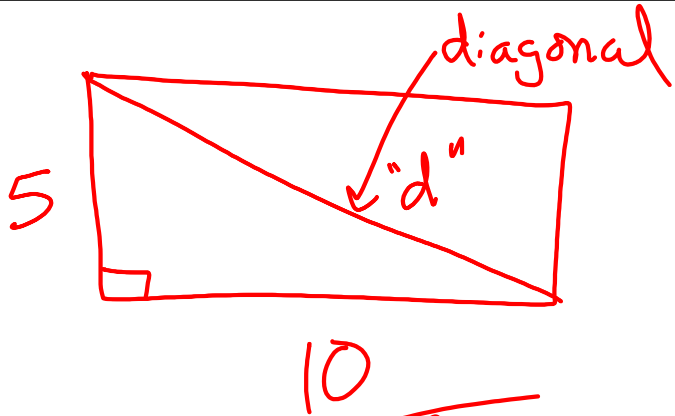
$(2\sqrt{5} - 4)^2$

$(2\sqrt{5} - 4)(2\sqrt{5} - 4)$

$4 \cdot 5 - 8\sqrt{5} - 8\sqrt{5} + 16$

$20 - 16\sqrt{5} + 16$

$36 - 16\sqrt{5}$



$$d = \sqrt{5^2 + 10^2}$$

$$25 + 100$$

$$d = \sqrt{125} = \sqrt{25} \cdot \sqrt{5}$$

$$= 5\sqrt{5}$$