Chapter 8 Review   **Name**_____KEY_____

Simplify the following. Final answer should only have positive exponents.

1. $x^3 \cdot 3^2 \cdot x \cdot 3$

$x^3 \cdot x^1 \cdot 3^2 \cdot 3^1$

$\boxed{x^4 \cdot 3^3}$

or

$3^3 x^4$

$\boxed{27x^4}$

2. $\left(r^2 s^2\right)^3$

$\boxed{r^6 s^6}$

multiply
power of a power
property

3. $(xy)^4 \cdot xy^2$

$x^4 y^4 \cdot xy^2$

$\boxed{x^5 y^6}$

4. $\left(4^0 x^3 y^{-5}\right)$

1

$\dfrac{1 x^3 y^{-5}}{1}$

$\boxed{\dfrac{x^3}{y^5}}$

5. $\left(\dfrac{1}{4}\right)^{-2}$

$\boxed{\dfrac{1^{-2}}{4^{-2}}}$

$\dfrac{4^2}{1^2} = \boxed{\dfrac{16}{1}}$

6. $\left(\dfrac{12x^4 y^{-2}}{3x^7 y^2}\right)^{4}$

$\dfrac{4 \; y^{-2}}{1 x^3 y^2}$

$\dfrac{4}{x^3 y^2 y^2}$

$\boxed{\dfrac{4}{x^3 y^4}}$

7. $\dfrac{\left(2x^3 y^4\right)^{-3}}{x^{-5} y^7}$

$\dfrac{2^{-3} x^{-9} y^{-12}}{x^{-5} y^7}$

$\dfrac{x^5}{2^3 x^9 y^{12} y^7}$

$\boxed{\dfrac{1}{8 x^4 y^{19}}}$

8. $\left(\dfrac{-7p^3}{q^{-5}}\right)^2$

$\dfrac{(-7)^2 \, p^6}{q^{-10}}$

$\boxed{49 p^6 q^{10}}$

Tell what number belongs in the box to complete each equation.

9. $7^3 \cdot 7^{[\;]} = 7^{11}$

8

Check: $7^3 \cdot 7^8 = 7^{11}$

10. $x^2 \cdot x^{[\;]} = \dfrac{1}{x^3}$

-5

Check
$= x^2 \cdot x^{-5}$
$= x^{-3}$
$= \dfrac{1}{x^3}$

11. $\left(t^5\right)^{[\;]} = 1$

0

Check
$= \left(t^5\right)^0$
$= t^0$
$= 1$

$$y = a \cdot b^x$$

initial amount ↑ ↗ Growth/decay factor

12. Given the function $y = 64\left(\frac{1}{2}\right)^x$, answer the following questions.
    (a) Is this function exponential growth or decay? Why?

    Decay. The base is less than 1.

    (b) What is the initial amount? Why?

    64. If $x = 0$, then $\left(\frac{1}{2}\right)^0 = 1$. So $64 \cdot 1 = \boxed{64}$

    (c) What does y equal when $x = 3$?

    $$y = 64 \cdot \left(\frac{1}{2}\right)^3$$
    $$= 64 \cdot \frac{1^3}{2^3}$$
    $$= 64 \cdot \frac{1}{8}$$
    $$= \boxed{8}$$

13. Given the function $y = 100(1.05)^x$, answer the following questions.
    (a) Is this function exponential growth or decay? Why?

    Growth. The base is greater than 1.

    (b) What is the initial amount? Why?

    100. If $x = 0$, then $(1.05)^0 = 1$. So $100 \cdot 1 = \boxed{100}$

    (c) What does y equal when $x = 3$?

    $$y = 100(1.05)^3$$
    $$= \boxed{115.76}$$

14. You buy 4 pet mice from the pet store. The number of mice triples every month.
    (a) Write a function for the number of mice after so many months. x = the number of months

    $$f(x) = 4(3)^x$$
    ↑ Triples

    (b) How many mice will you have after one year (12 months)?

    $$f(12) = 4(3)^{12}$$
    $$= \boxed{2{,}125{,}764 \text{ mice}}$$

16. You buy a car for $40,000 and it depreciates in value by 15% a year.
    (a) Write a function for the amount of money your car is worth after so many years.

    time
    $$y = a(1 - r)^t$$
    initial amount / rate as a decimal
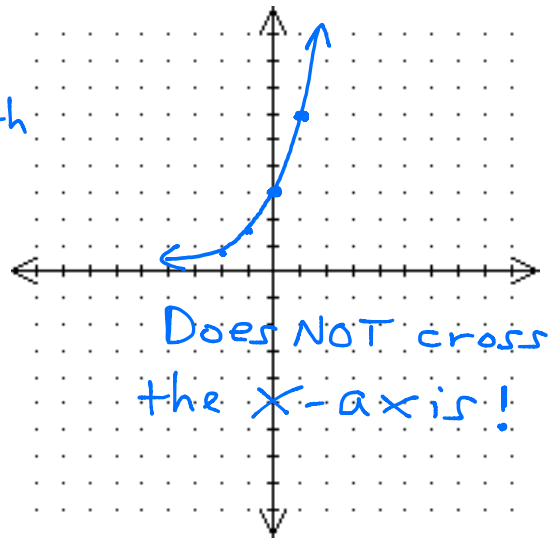
    $$\boxed{f(t) = 40{,}000(1 - .15)^t}$$
    $40{,}000(.85)^t$ or

    (b) How much is your car worth after 3 years?

    $$40000(1 - .15)^3$$
    $$\boxed{\$24{,}565}$$

17. Fill in the table below for the function $y = 3(2)^x$, then graph it on the right.

x	y
-2	$3 \cdot 2^{-2} = 3 \cdot \frac{1}{2^2} = \boxed{\frac{3}{4}}$
-1	$3 \cdot 2^{-1} = 3 \cdot \frac{1}{2^1} = \boxed{\frac{3}{2}}$
0	$3 \cdot 2^0 = 3 \cdot 1 = \boxed{3}$
1	$3 \cdot 2^1 = 3 \cdot 2 = \boxed{6}$
2	$3 \cdot 2^2 = 3 \cdot 4 = \boxed{12}$

Growth

Does NOT cross the X-axis!

18. Fill in the table below for the function $y = \left(\frac{1}{4}\right)^x$, then graph it on the right.

x	y
-2	$\left(\frac{1}{4}\right)^{-2} = \left(\frac{4}{1}\right)^2 = \boxed{16}$
-1	$\left(\frac{1}{4}\right)^{-1} = \left(\frac{4}{1}\right)^1 = \boxed{4}$
0	$\left(\frac{1}{4}\right)^0 = \boxed{1}$
1	$\left(\frac{1}{4}\right)^1 = \boxed{\frac{1}{4}}$
2	$\left(\frac{1}{4}\right)^2 = \frac{1}{4^2} = \boxed{\frac{1}{16}}$

Decay
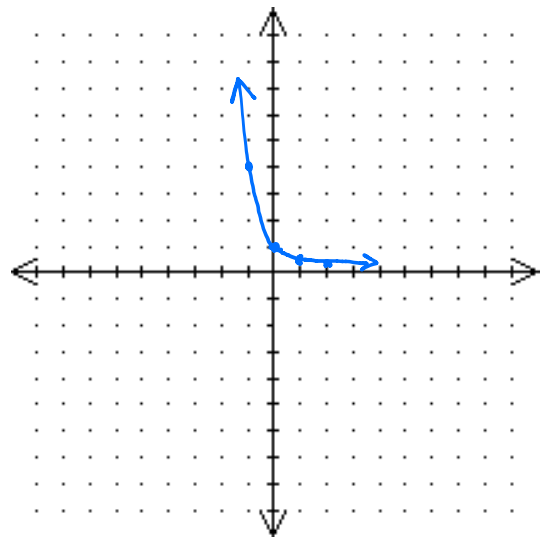
Chapter 7 Review over solving systems of equations.
Solve each system of equations with substitution or elimination. Graph paper is provided if needed.

19. $y = 5x - 3$
    $y = 3x + 1$

$3x + 1 = 5x - 3$
$-3x \qquad -3x$
$1 = 2x - 3$
$+3 \qquad +3$
$\frac{4}{2} = \frac{2x}{2}$
$\boxed{2 = x}$

$y = 5(2) - 3$
$10 - 3$
7

$\boxed{(2, 7)}$

20. $2x + 3y = 10$ ⟩ $* 5$
    $-10x - y = 6$

$10x + 15y = 50$
$-10x - y = 6$
$\overline{14y = 56}$
$\boxed{y = 4}$

$2x + 3(4) = 10$
$2x + 12 = 10$
$\quad -12 \quad -12$
$2x = -2$
$\boxed{x = -1}$

$\boxed{(-1, 4)}$

21. $2x + 2y = 0$
    $y = -6x - 10$

$2x + 2(-6x - 10) = 0$
$2x - 12x - 20 = 0$
$-10x - 20 = 0$
$\frac{-10x}{-10} = \frac{20}{-10}$
$\boxed{x = -2}$

$y = -6(-2) - 10$
$12 - 10$
$\boxed{2}$

$\boxed{(-2, 2)}$