

Unit 2 Review Problems

1. Rewrite the expression $\frac{3^{15} \cdot 3^{-3}}{3^{-5} \cdot 3^7}$ as a single term of the form 3^n , where n is an integer. Show your work.

$$\frac{3^{12}}{3^2} = 3^{10}$$

$$3^a \cdot 3^b = 3^{a+b}$$

1. Write the expression $(-7) \cdot (-7) \cdot (-7) \cdot \overbrace{x \cdot x \cdot x}^{x^3} \cdot \overbrace{y}^y$ in exponential form.

A. $-7^3 x^3$

B. $(-7)^3 x^3 y$

C. $(-7)^3 + x^3 + y$

D. $-7xy^4$

$$(-7)^3 x^3 y$$

21. Determine which of the following expressions are equivalent to the following expression. (Choose three answers)

$$4x^3(2x^4 \cdot x^2) = 8x^3 x^4 x^2 = 8x^9$$

A. ~~$8x^7 x^2$~~

B. $8x^7(x^2)$

C. ~~$8x^{14}$~~

D. $8x^7 x^2$

E. $8x^9$

F. ~~$8x^7 + 4x^5$~~

Given the explicit formula for a geometric sequence find the first five terms and the 8th term.

7) $a_n = 3^{n-1}$

$n=1$

$a_1 = 1$ $a_2 = 3$ $a_3 = 9$ $a_4 = 27$ $a_5 = 81$

$a_8 = 3^7 = 2187$

8) $a_n = 2 \cdot \left(\frac{1}{4}\right)^{n-1}$

$a_1 = 2$ $a_2 = \frac{1}{2}$ $a_3 = \frac{1}{8}$ $a_4 = \frac{1}{32}$ $a_5 = \frac{1}{128}$

$a_8 = 2\left(\frac{1}{4}\right)^7 = 2\left(\frac{1}{16384}\right) = \frac{1}{8192}$

Average Rate of change: Slope between two points.

Along with incomes, people's charitable contributions have steadily increased over the past few years. The table below shows the average deduction for charitable contributions reported on individual income tax returns for the period 1993 to 1998. Find the average rate of change per year between 1995 and 1997.

Year	Charitable Contributions
1993	\$1850
1994	\$2420
1995	\$2480
1996	\$2810
1997	\$3100
1998	\$3150

(1995, 2480)

(1997, 3100)

$$\frac{3100 - 2480}{1997 - 1995} = \frac{620}{2} = 310 \text{ \$/yr}$$

A) \$340 per year

B) \$310 per year

C) \$335 per year

D) \$620 per year

The table below provides points on the function $y=f(x)$.

x	1	2	3	4	5	6
y	-3	4	5	2	1	-3

a. Find the average rate of change from $x=2$ to $x=5$.

$$\begin{matrix} (2, 4) \\ (5, 1) \end{matrix} \quad \frac{1-4}{5-2} = -\frac{3}{3} = -1$$

b. Find the average rate of change from $x=1$ to $x=6$. How can you quickly determine that rate of change without having to calculate anything?

$$\begin{matrix} (1, -3) \\ (6, -3) \end{matrix} \quad \frac{-3 - (-3)}{6 - 1} = \frac{0}{5} = 0$$

The y -values at $x=1$ and $x=6$ are the same, so the slope will be 0.

For the functions below, write them as their exponential equivalent.

a. $\log_3(x) = 4$
 $3^4 = x$

b. $\log_4(2) = x$
 $4^x = 2$

c. $\log_{\frac{1}{2}}(x) = 3$
 $\left(\frac{1}{2}\right)^3 = x$

12. Solve each equation. Express your answer as a logarithm or exponent.

a. $25(3)^{x+1} = 50$

$$3^{x+1} = 2$$

$$\log_3(2) = x+1$$

$$\log_3(2) - 1 = x$$

b. $100(e^{2x}) - 200 = 300$

$$100e^{2x} = 500$$

$$e^{2x} = 5$$

$$\ln(5) = 2x$$

$$\frac{\ln(5)}{2} = x$$

remember

$$\ln(a) = \log_e(a)$$

c. $\ln(3x) - 1 = 9$

$$\ln(3x) = 10$$

$$e^{10} = 3x$$

$$\frac{e^{10}}{3} = x$$

13. If $y=f(x)$ is a function graphed in the coordinate plane, which of the functions below contains a reflection of $f(x)$ over the x -axis? Select all that apply.

a. $-f(x) - 1$

b. $f(-x) - 4$ *ref. over y*

c. $f(-x - 1) + 2$

d. $-f(x + 3) - 3$

e. $-3f(x) + 1$

need to negate all outputs.

14. Which of the following functions displays a percent rate of change of 3.1%?

a. $g(t) = 3(1.31)^t$

b. $h(t) = 2(3.1)^t$

c. $j(t) = 10(1.031)^t$

d. $k(t) = 20(1.0031)^t$

e. $m(t) = 7(0.031)^t$

$$A = P(1 + 0.031)^t$$

$$A = P(1.031)^t$$

15. The concentration of carbon dioxide dissolved in a soda that is left uncapped decays at a constant rate of 20% per hour. An unopened 2-liter coke has a concentration of about 0.14 moles/liter of carbon dioxide.

initial

a. Write a model that would give the concentration of carbon dioxide in the coke after h hours.

$$A(h) = 0.14(1 - 0.2)^h$$

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

$$r = 0.2$$

$$A(h) = 0.14(0.8)^h$$

b. How long would it take until the concentration of carbon dioxide is 0.05 moles/liter?

$$0.05 = 0.14(0.8)^h$$

$$\frac{0.05}{0.14} = (0.8)^h$$

$$\log_{(0.8)}\left(\frac{0.05}{0.14}\right) = h \approx 4.164 \text{ hrs}$$

c. What is the half-life of concentration of carbon dioxide in the coke?

$A = 0.07$ since 0.14 is initial
 $h = ?$

$$0.07 = 0.14(0.8)^h$$

$$\frac{0.07}{0.14} = (0.8)^h$$

$$\log_{(0.8)}\left(\frac{0.07}{0.14}\right) = h \approx 3.106 \text{ hrs}$$

16. Markwalter invests \$200 in a bank that compounds interest continually at rate of 0.1% annually.

$r = 0.001$

Write a model that would show the amount of money in Markwalter's account after t years.

$$A = Pe^{rt}$$

$$A = 200e^{0.001t}$$