

Review Worksheet for Unit 4 Test

Name Key

Date _____

Simplify.

1) $(6x^3y^2)^2$

$$36x^6y^4$$

2) $\frac{12y^{-4}}{3y^{-5}}$

$$\frac{4y^5}{y^4} = \boxed{4y}$$

3) $\frac{(3x^{-1})^{-2}}{(3x^2)^{-2}}$

$$\frac{\cancel{3^{-2}}x^2}{\cancel{3^{-2}}x^{-4}} = \boxed{x^6}$$

4) $\left(\frac{6xy^{11}z^9}{48x^6yz^{-7}}\right)^0$

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Solve.

5) $3^{3x} = 81$

$$3^{3x} = 3^4$$

$$\frac{3x}{3} = \frac{4}{3}$$

$$\boxed{x = \frac{4}{3}}$$

6) $\left(\frac{1}{32}\right) = 4^{2x}$

$$2^{-5} = 2^{2(2x)}$$

$$\frac{-5}{4} = \frac{4x}{4}$$

$$\boxed{x = -\frac{5}{4}}$$

7) $5^{6x-1} = 1$

$$5^{6x-1} = 5^0$$

$$\frac{6x-1}{+1} = \frac{0}{+1}$$

$$\frac{6x}{6} = \frac{1}{6}$$

$$\boxed{x = \frac{1}{6}}$$

Evaluate each expression as a fraction (when necessary) for the given value of x.

8) 2^{x+1} for $x = -3$

$$2^{-2} = \boxed{\frac{1}{4}}$$

9) $12(0.5)^x$ for $x = 2$

$$12(0.5)^2$$

$$12(0.25)$$

$$= \boxed{3}$$

10) $6(.25)^{2x}$ for $x = -2$

$$6(0.25)^{-4}$$

$$6(256)$$

$$= \boxed{1536}$$

Find the next three terms in each geometric sequence.

11) $-5, 15, -45, 135, -405, \underline{1215}, \underline{-3645}, \underline{10935}$

Tell whether the sequence is geometric. If yes, write the explicit and recursive formula.

12) $100, 50, 25, \frac{25}{2}, \frac{25}{4}, \dots$

13) $1, 3, 5, 7, \dots$

14) $-6, -2, -\frac{2}{3}, -\frac{2}{9}, \dots$

yes
 Recursive: $A_n = \frac{1}{2}A_{n-1}$
 Explicit: $A_n = 100\left(\frac{1}{2}\right)^{n-1}$
 $A_1 = 100$

NO

yes
 Recursive: $A_n = \frac{1}{3}A_{n-1}$
 Explicit: $A_n = -6\left(\frac{1}{3}\right)^{n-1}$
 $A_1 = -6$

Determine whether the function is growth or decay. Increasing or Decreasing?

15) $y = -4^x$

16) $y = 2(0.23)^x$

17) $y = -6(1.8)^x$

Growth
 Decreasing

Decay
 Decreasing

Growth
 Decreasing

Set up an equation and solve for each.

18) The doctor told you that the antibiotic he gave you would kill half the bacteria every 8 hours. If you had 4 billion bacteria in your body, how many would you have in a week?

$$y = 4000000000 \left(\frac{1}{2}\right)^x$$

168 hrs. in 1 week

$$\frac{168}{8} = 21$$

$$y = 4000000000 \left(\frac{1}{2}\right)^{21}$$

1907 bacteria

19) A lab sample contains 30 bacteria that doubles every 90 minutes. Predict the number of bacteria after 6 hours.

$$y = 30(2)^x$$

90 min = 1.5 hrs.

$$6/1.5 = 4$$

$$y = 30(2)^4$$

480 bacteria

20) A physician gives a patient 500 milligrams of an antibiotic that is eliminated from the bloodstream at a rate of 8% per hour. Predict the number of milligrams left after 4 hours.

$$y = 500(1 - 0.08)^t$$

$$y = 500(0.92)^4$$

358.2 milligrams

21) A civil service employee will receive a 2.5% raise each year. If his current salary is \$24,500. What will his salary be in 4 years?

$$y = 24500(1 + 0.025)^t$$

$$y = 24500(1.025)^4$$

\$ 27,043.42

22) A piece of farm equipment depreciates 9% per year. If the current value of the equipment is \$30,000, how long will it be before it depreciates to \$18,000?

$$18000 = 30000(1 - 0.09)^t$$

$$18000 = 30000(0.91)^t$$

$$0.6 = (0.91)^t$$

6 years

*Amount needs to be below \$18,000.

23) If you invest \$30,000 at 5.3% annual interest, how much money will you have in 4 years if the interest is compounded monthly?

$$A = 30000 \left(1 + \frac{0.053}{12}\right)^{12(4)}$$

$$A = 30000(1.00442)^{48}$$

\$ 37,067.13

Graph the following and tell the characteristics:

24) $y = -2^x + 3$

Transformations: reflect over x-axis + up 3

Asymptote: $y = 3$

Domain: $(-\infty, \infty)$

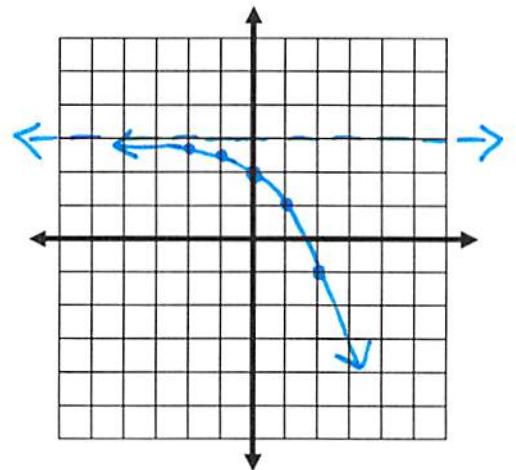
Range: $(-\infty, 3)$

Increasing or Decreasing? Decreasing

x-intercept: $(1.6, 0)$

y-intercept: $(0, 2)$

End Behavior: As $x \rightarrow -\infty$, $f(x) \rightarrow 3$
As $x \rightarrow +\infty$, $f(x) \rightarrow -\infty$



x	y
-2	2.75
-1	2.5
0	2

x	y
1	1
2	-1

25) $y = -3^{x-1} + 2$

Transformations: reflect over x-axis, right 1, up 2

Asymptote: $y = 2$

Domain: $(-\infty, \infty)$

Range: $(-\infty, 2)$

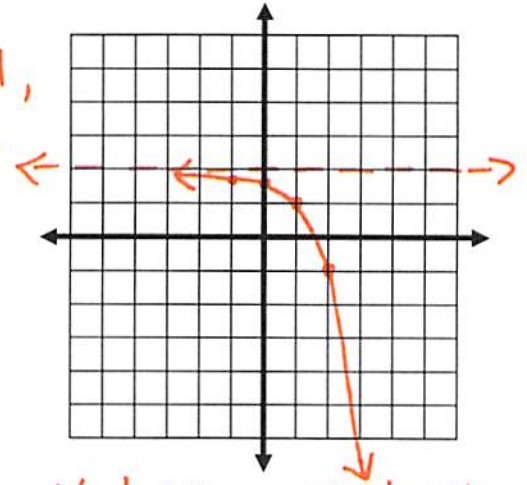
Increasing or Decreasing? Decreasing

x-intercept: $(1.65, 0)$

y-intercept: $(0, 1.7)$

End Behavior: As $x \rightarrow -\infty$, $f(x) \rightarrow 2$

As $x \rightarrow +\infty$, $f(x) \rightarrow -\infty$



x	y
-1	1.9
0	1.7
1	1

x	y
2	-1
3	-7

26) Find the characteristics of each function.

x	f(x)
0	5
1	15
2	45
3	135

a. Equation: $y = 5(3)^x$

Domain: $(-\infty, \infty)$

Range: $(0, \infty)$

x-intercept: None

y-intercept: $(0, 5)$

Inc or Dec: Increasing

ROC from $x=0$ to $x=4$:

$(0, 5), (4, 405)$ $\frac{405 - 5}{4 - 0} = \frac{400}{4}$
ROC = 100

b. Equation: $g(x) = 150(0.5)^x$

Domain: $(-\infty, \infty)$

Range: $(0, \infty)$

x-intercept: None

y-intercept: $(0, 150)$

Inc or Dec: Decreasing

ROC from $x=0$ to $x=4$:

$(0, 150), (4, 9.375)$ $\frac{9.375 - 150}{4 - 0} = \frac{-140.625}{4}$
ROC = -35.2

27) Using the equations and characteristics from #26, answer the following questions.

Characteristic of F(x)	<, >, or =	Characteristic of G(x)
y-intercept of F(x) = <u>$(0, 5)$</u>	<u><</u>	y-intercept of G(x) = <u>$(0, 150)$</u>
F(4) = <u>405</u>	<u>></u>	G(4) = <u>9.375</u>
ROC of F(x) from [0, 4] = <u>100</u>	<u>></u>	ROC of G(x) from [0, 4] = <u>-35.2</u>

ROC = -35.2