

Algebra 1-2 H
Final Exam Review

1. Suppose you want to make a reduced copy of a photograph that has an actual length of 5 inches. Each time you press the reduce button on the copier, the copy is reduced by 7%. What is the length of the photograph's copy if you press the reduce button 3 times? Round to the nearest hundredth.

$$f(x) = 5(0.93)^3$$
$$= 4.02 \text{ inches}$$

2. A city's population, P , in thousands, can be modeled by the equation $P = 565(1.02)^t$, where t is the number of years since the year 1995.

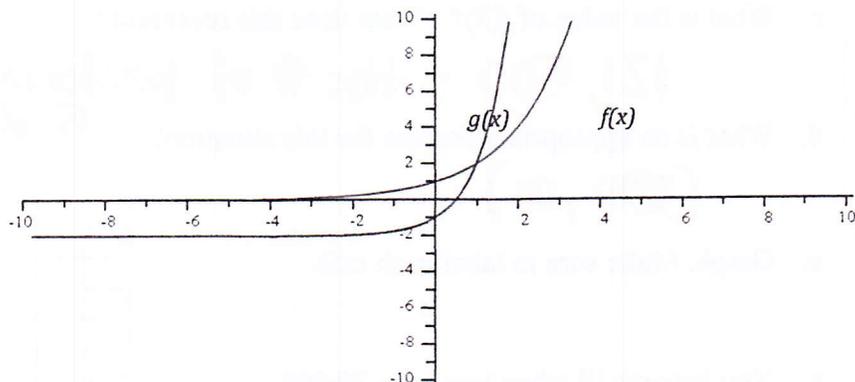
- a. In the given equation, what does the number 565 represent?

initial population

- b. In the given equation, what does the number 1.02 represent?

growth rate of 2%.

3. The following is a graph of the 2 functions below: $f(x) = 2^x$ and $g(x) = 4^x - 2$



- a) Approximate where $f(x) < g(x)$.

(1, 2)

- b) Approximate the intercepts of $g(x)$.

x: $(\frac{1}{2}, 0)$

y: $(0, -1)$

c) Domain of $g(x)$.

$$(-\infty, \infty)$$

d) Range of $f(x)$.

$$(0, \infty)$$

e) Describe the transformation from $f(x)$ to $g(x)$.

The graph is shifted down 2 and grows at a faster rate.

4. A scientist conducts an experiment on the growth of a certain bacteria culture. The variable t represents the number of days since the beginning of the experiment. When $t = 0$, there were 500 bacteria in the culture. Every day, the number of bacteria in the culture increases by a factor of 3.

a. Every day, the number of bacteria in the culture increases by a factor of b .

What is the value of b ? Explain.

$b = 3$ It is the number the bacteria is mult. ~~to~~ by every day. It triples!

b. Using the information for your experiment, write the function in the form of: $f(t) = a(b)^t$

$$f(t) = 500(3)^t$$

c. What is the value of $f(5)$? What does this represent?

121,500 - the # of bacteria present after 5 days.

d. What is an appropriate domain for this situation?

$$[0, \infty)$$

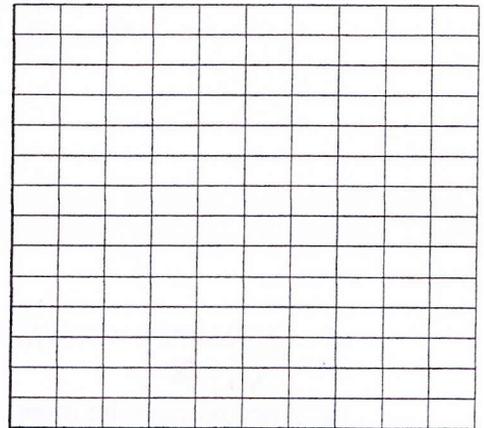
e. Graph. Make sure to label each axis

f. You become ill when you have 70,000 bacteria in your body. Approximately when will you become ill?

$$\frac{70,000}{500} = \frac{500(3)^t}{500}$$

$$140 = 3^t$$

4-5 days



5. Given 8, 12, 16, ... write an explicit formula in terms of n and use it to find a_{12}

$$a_n = a_1 + d(n-1): a_n = 8 + 4(n-1) \text{ or } a_n = 4n + 4$$

$$a_{12} = 8 + 4(11) = 8 + 44 = 52$$

6. Write the recursive formula for the following sequence: 2, 8, 32, 128 ...

$$r = 4$$

$$a_n = r(n-1)$$

$$a_n = 4(n-1) \text{ or } a_n = 4n - 4$$

7. Determine whether the table represents a linear or exponential function. Explain.

x	1	2	3	4
y	2	4	8	16

~~Exponential~~ Exponential. It is geometric and does not increase at a constant rate.

8. At birth, Mary is given a \$500 savings bond. The value of the bond grows at 13% per year.

- a. Write a function that represents Mary's savings bond.

$$f(t) = 500(1.13)^t$$

- b. What will the value of the bond be when she is 18?

$$f(18) = 500(1.13)^{18}$$

$$\$4512.13$$

- c. Considering that amount of money at 18, if she were to withdraw the money, what could she use it for?

Answers vary

ex: used car
Semester of college

9. $-2x + 5x^4 - 2 + x^2 + 7x^5$

Standard Form: $7x^5 + 5x^4 + x^2 - 2x - 2$

Degree: 5th

Leading Coefficient: 7

Number of Terms: 5

10. Multiply the following polynomials.

a. $(2x-4)^2$ $4x^2 - 16x + 16$

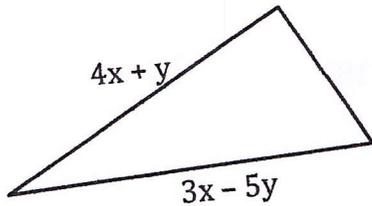
b. $(3x-5)(x^2+4x-3)$

$$\begin{array}{r} 3x^3 + 12x^2 - 9x \\ -5x^2 - 20x + 15 \\ \hline 3x^3 + 7x^2 - 29x + 15 \end{array}$$

d. $(x^2+6x-1)(2x^3-2x+4)$

$$\begin{array}{r} 2x^5 - 2x^3 + 4x^2 + 12x^4 - 12x^2 + 24x - 2x^3 + 2x - 4 \\ \hline 2x^5 + 12x^4 - 4x^3 - 8x^2 + 26x - 4 \end{array}$$

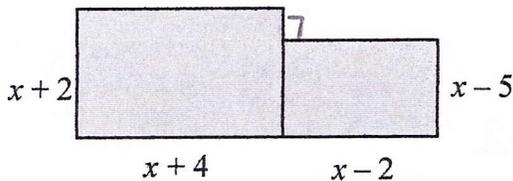
11. Find the measure of the third side of the triangle. The perimeter is represented by the expression: $P = 9x + 24y$



$$9x + 24y = 4x + y + 3x - 5y + \boxed{}$$

$$9x + 24y = 7x - 4y + \boxed{2x + 28y}$$

12. Find the area and perimeter of the shape below.



A: $(x+2)(x+4) + (x-2)(x-5)$
 $x^2 + 6x + 8 + x^2 - 7x + 10$
 $2x^2 - x + 18$

$$(x+2) - (x-5)$$

$$x+2 - x+5$$

$$7$$

P: $x+2 + x+4 + x-2 + x-5 + 7 + x+4$
~~6x+8~~ $+ x - 2$
 $6x + 8$

13. Factor each polynomial.

a. $3x^2 + 27$

$3(x^2 + 9)$

b. $\frac{6x^3y^3 + 8x^2y^2}{2x^2y^2}$

$2x^2y^2(3xy + 4)$

1 24
2 12
3 8
4 6

c. $x^2 + 6x + 5$

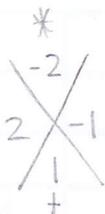
$(x+5)(x+1)$

d. $x^2 - 12x + 24$

prime
(not factorable)

e. $\frac{x^3 + x^2 - 2x}{x}$

$x(x^2 + x - 2)$
 $x(x+2)(x-1)$



f. $4x^2 - 36$

$(2x+6)(2x-6)$
 $2(x+3) \cdot 2(x-3)$
 $4(x+3)(x-3)$

14. The height of a golf ball in feet t seconds after it is hit is defined by the function

$f(x) = -16t^2 + 100t$. How high will the golf ball be after 4 seconds?

$f(4) = -16(16) + 100(4)$
 $= -256 + 400$
 $= 144 \text{ ft.}$

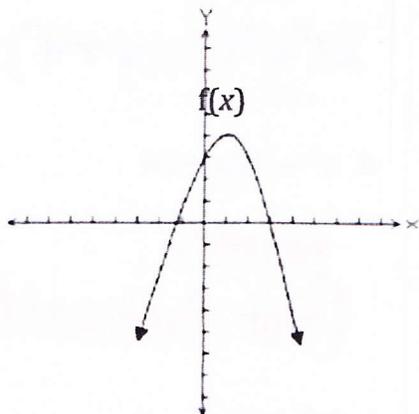
15. Which of the following is true of the graph of $y = ax^2 + 4x - 2$, where a is a positive integer not equal to zero. Choose all that apply:

- a. The graph is a parabola.
- b. The graph has a minimum value
- c. All of the above.

- d. The y-intercept is negative.
- e. The graph has two zeros.
- f. None of the above.



16. The graph of the quadratic function $f(x)$ is shown in the coordinate plane below. The table of the linear function $g(x)$ is shown below. Indicate the relationship between each pair of quantities in the table below by placing $>$, $<$, or $=$ in the middle column.



x	$g(x)$
-2	-1
-1	2
0	5
1	8
2	11
3	14
4	17
5	20

First Quantity	$>$, $<$, or $=$	Second Quantity
y -intercept of $f(x)$	$<$	y -intercept of $g(x)$
$f(3)$	$<$	$g(3)$
Maximum value of $f(x)$ on the interval $0 \leq x \leq 6$	$<$	Maximum value of $g(x)$ on the interval $0 \leq x \leq 6$

17. Graph $y = 2x^2 - x - 3$ using a table of values. Answer the questions that follow.

a. Graph using the table of values

b. x -intercept(s): $(-1, 0)$ $(\frac{3}{2}, 0)$

c. y -intercept(s): $(0, -3)$

d. Does the graph have a max or min?

min

e. Number of Solutions: 2

f. Domain $(-\infty, \infty)$

g. Range $[-3\frac{1}{8}, \infty)$

x	y
-1	0
0	-3
$\frac{1}{4}$	$-3\frac{1}{8}$
1	-2
2	3

V

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

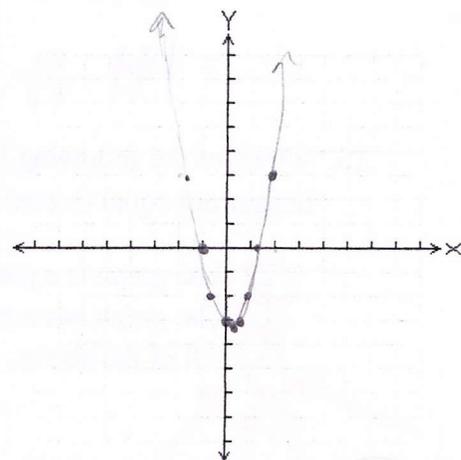
$$= \frac{1}{4}$$

$$2(\frac{1}{16}) - \frac{1}{4} - 3$$

$$\frac{1}{8} - \frac{12}{48} - 3$$

$$-\frac{1}{8} - 3$$

$$-3\frac{1}{8}$$



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

$$x^2 - x - 6$$

$$(x-3)(x+2)$$

$$\frac{2}{2} \quad \frac{2}{2}$$

$$x = \frac{3}{2} \quad x = -1$$

18. Solve.

a. $f(x) = x^2 - x + 3$
 $0 = x^2 - x + 3$
 $\frac{1 \pm \sqrt{1 - 4(1)(3)}}{2}$

no real solution

b. $0 = 5x^2 - 4x - 3$
 $\frac{4 \pm \sqrt{16 - 4(-15)}}{10}$
 $\frac{4 \pm \sqrt{76}}{10}$
 $x = 1.27, -0.47$

1 42
 2 21
 3 14
 6 7

c. $21 + x = 2x^2$
 $-2x^2 + x + 21 = 0$
 $-2x^2 - 6x + 7x + 21 = 0$
 $-2(x+3) + 7(x+3)$

$(-2x+7)(x+3)$
 $x = \frac{7}{2}, -3$

d. $y = 16x^2 - 81$
 $(4x+9)(4x-9)$
 $x = -\frac{9}{4}, \frac{9}{4}$

19. What are the coordinates of the vertex of $f(x) = 5(x+3)^2 - 6$?

$(-3, -6)$

20. You and your friends are dangerously launching bottle rockets from the ground level directly upward at 112 ft/s. The path of the bottle rocket is modeled by $h(t) = -16t^2 + v_0t + h_0$.

Answer the following for the given scenario:

112 0 $\begin{array}{r} 31 \\ 448 \\ -256 \\ \hline 192 \end{array}$

a. What is the initial height?

0 ft

b. What is the height of the rocket after 4 seconds?

$-16(16) + 112(4) + 0 = -256 + 448 = 192 \text{ ft.}$

c. What is the max height of the rocket?

$x = \frac{-b}{2a} = \frac{-112}{2(-16)} = \frac{-112}{-32} = 3.5$

$-16(3.5)^2 + 112(3.5) + 0 = 196 \text{ ft.}$

d. How long will it take to reach it's max height?

3.5 sec.

21. The length of a rectangle is 9 inches more than twice the width. The area is 35 in^2 .

a. Write a function that represents the given scenario. Use w for width.

$$l = 2w + 9$$

$$A = l \cdot w \rightarrow 35 = (2w + 9)(w) \text{ or } 35 = 2w^2 + 9w$$

$$A(w) = 2w^2 + 9w - 35$$

b. What are the dimensions of the rectangle?

$$l: 14 \text{ in.}$$

$$w: \frac{5}{2} \text{ or } 2\frac{1}{2} \text{ in.}$$

$$A = 35 \text{ in}^2$$

$$35 = 2w^2 + 9w$$

$$2w^2 + 9w - 35 = 0$$

$$2w^2 + 14w - 5w - 35$$

$$2w(w + 7) - 5(w + 7)$$

$$(2w - 5)(w + 7) = 0$$

$$w = \frac{5}{2} \quad w = -7$$

22. Which expression has a domain of $[1, \infty)$?

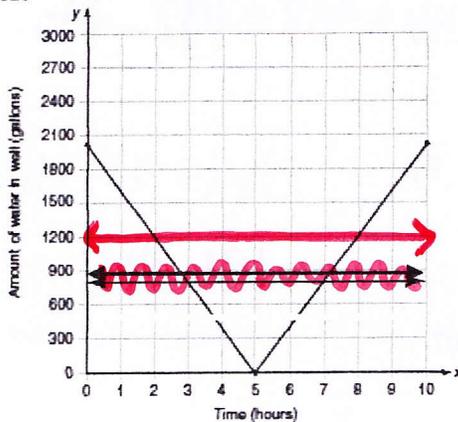
~~a.~~ $f(x) = \sqrt{x+1} + k$ **b.** $f(x) = \sqrt{x-1}$

c. $f(x) = \sqrt{x} + 1$

d. $f(x) = \sqrt{x} - 1$

23. A well, when full, contains 2000 gallons of water. Suppose that the full well is drained and then refilled at the same rate it was drained. This process of draining the well and then refilling it is called a cycle, and one cycle takes 10 hours.

The graph shows two equations. One equation shows the amount of water in the well during one cycle, and the other equation shows a constant amount of 1200 gallons of water in the well. Use the graph to determine the times during a cycle when the well will have more than 1200 gallons of water.



a. 2 – 8 hours

b. 0 – 2 hours and 8 – 10 hours

c. 0 – 2 hours and 5 – 8 hours

d. 8 – 10 hours

24. What is the vertex of the function $f(x) = -0.3|2x - 3| - 2$?

$\frac{3}{2}(\underline{3}, -2)$

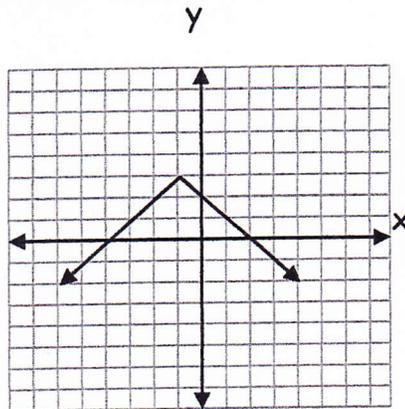
Because of 2 in front of x.

25. Write the equation given the following graph. State the domain and range.

Equation: $f(x) = -|x+1| + 3$

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

Range: $(-\infty, 3]$



26. Compare and Contrast the transformations of the graphs from the parent function.
 $f(x) = |x| - 1$ and $g(x) = |x - 1|$.

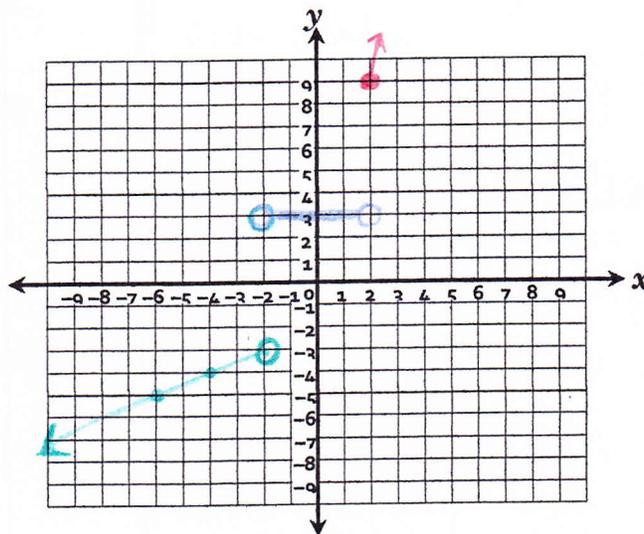
Transformation: $f(x)$ is shifted down 1 unit
 $g(x)$ is shifted right 1 unit

Domain: $f(x): (-\infty, \infty)$
 $g(x): (-\infty, \infty)$ > same domain as parent function

Range: $f(x): [-1, \infty)$
 $g(x): [0, \infty)$ → same as parent function

27. Graph the following piecewise function:

$$f(x) = \begin{cases} 3^x & \text{for } x \geq 2 \\ 3 & \text{for } -2 < x < 2 \\ \frac{1}{2}x - 2 & \text{for } x < -2 \end{cases}$$



X	Y
-1	1/3
0	1
2	9
3	27
4	

X	Y
-2	-3
-4	-4
-6	-5



$$f(x) = x^2 - 4x + 4$$

26. The graph of the function $f(x) = x^2 - 4x + 4$ is shown below.

The function $f(x)$ is a parabola that opens upwards. The vertex of the parabola is at $(2, 0)$.

27. The graph of the function $f(x) = x^2 - 4x + 4$ is shown below.

$$f(x) = x^2 - 4x + 4$$

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28. The graph of the function $f(x) = x^2 - 4x + 4$ is shown below.



$$f(x) = x^2 - 4x + 4$$

The function $f(x)$ is a parabola that opens upwards. The vertex of the parabola is at $(2, 0)$.