Algebra 1 Semester 2 Study Guide Part 1

Exponential Functions – HSA -SSE.A.1, HSA -REI.D.10, HSF -IF.B.5, HSF -IF.C.7, HSF -IF.C.8, HSF -IF.C.9, HSF-LE.A.1, HSF-LE.B.5

1. Sketch a graph that shows exponential:
   a) Growth 
   b) Decay 

For # 2 – 6, tell if:

a) the equation represents growth or decay
b) the growth or decay factor
c) the percent of growth or decay
d) the initial value
e) graph the function
f) tell the domain and range

on graphs

2. $y = 35(0.57)^x$ 3. $y = 1.3^x$ 4. $y = 1.4(1.03)^x$ 5. $y = 4.5(0.95)^x$ 6. $y = 8(3)^x$

7. Of #2 – 6, which shows the greatest growth? #6

8. The population in 2012, of a small Upper Peninsula town was approximately 2,500. The following equation can be used to model the change, $g(t)$, over time, t, in years: $g(t) = 2500(1.15)^t$

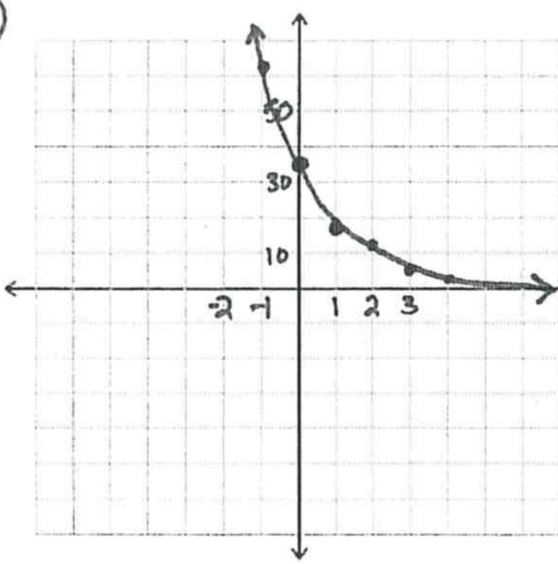
a) What is the percent of growth or decay per year in this town? 15% growth
b) Is the population increasing or decreasing? Explain how you know. Increasing; base > 1
c) Where will the graph of the function cross the y-axis? Explain how you know. 2,500; initial value
d) What does the y- intercept indicate in the context of the problem? Initial population
e) How would an increase in the percentage rate of growth affect the graph of the function? steeper/faster increase
f) What will be the predicted population in 2020? 7,647 people

9. A certain stock is worth $42 at the beginning of the day. Every hour the stock goes down by 5%.

a) Can this information be represented by exponential growth or decay? Explain. Decay; stock is going down
b) What is the growth or decay factor for this information? Explain how you found it. .95; 1-r
c) Write an equation to model this information. Explain what each part means. $f(x) = 42(.95)^x$
d) How much will the stock be worth in 8 hours? Show work. $f(8) =$ $27.86

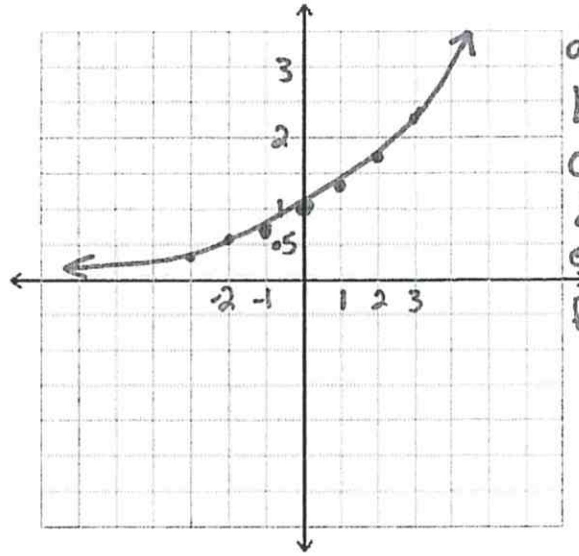
10. A dust bunny gathers dust at a rate of 11% per week. The dust bunny originally weighs 0.7 oz.
   a) Write a function that represents the weight of the dust bunny at a given time. Use x for weeks and y for the weight of the dust bunny. $f(x) = 0.7(1.11)^x$
   b) Find the weight of the dust bunny after 7 weeks. $f(7) = 1.45$ oz

2.)



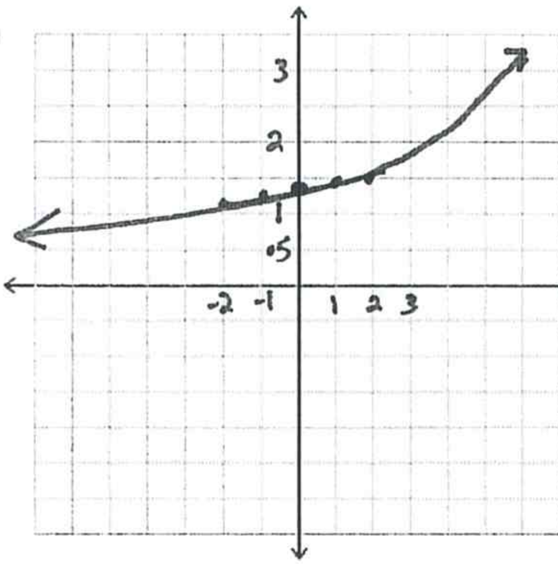
a.) Decay
b.) .57
c.) 43%
d.) 35
e.) (-∞,∞)
f.) (0,∞)

3.)



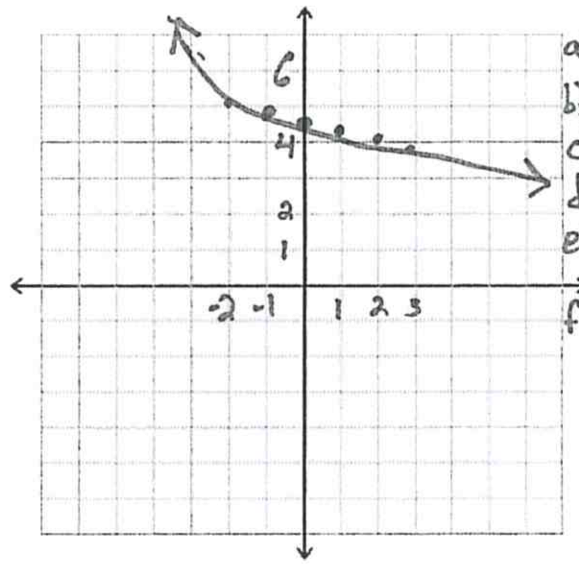
a.) Growth
b.) 1.3
c.) 30%
d.) 1
e.) (-∞,∞)
f.) (0,∞)

4.)



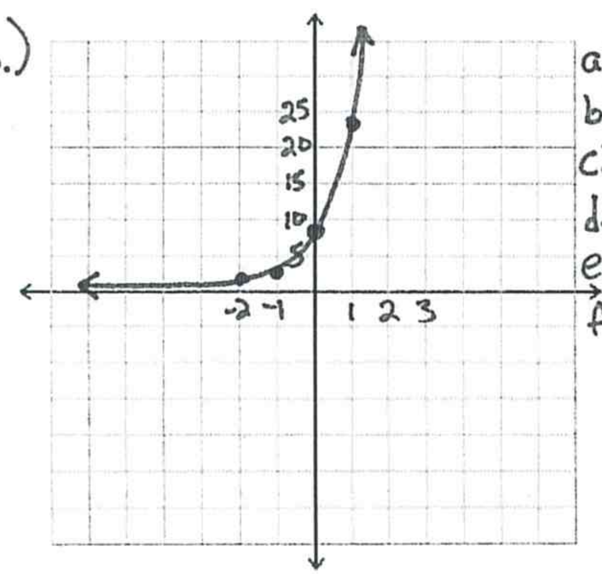
a.) Growth
b.) 1.03
c.) 3%
d.) 1.4
e.) (-∞,∞)
f.) (0,∞)

5.)

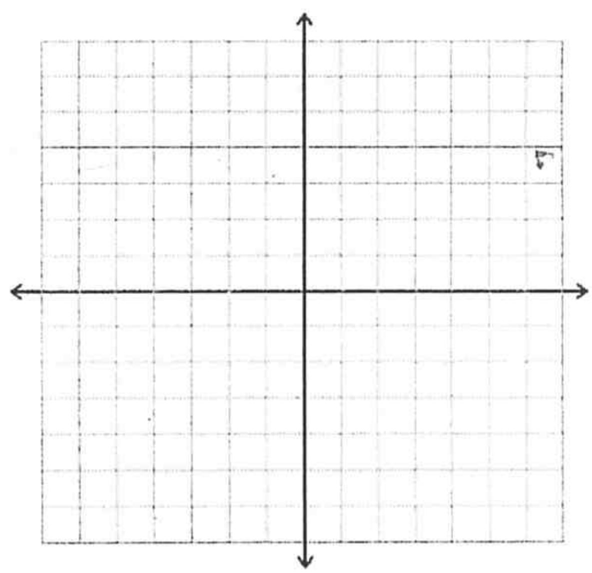


a.) Decay
b.) .95
c.) 5%
d.) 4.5
e.) (-∞,∞)
f.) (0,∞)

6.)



a.) Growth
b.) 3
c.) 200%
d.) 8
e.) (-∞,∞)
f.) (0,∞)



Part 2

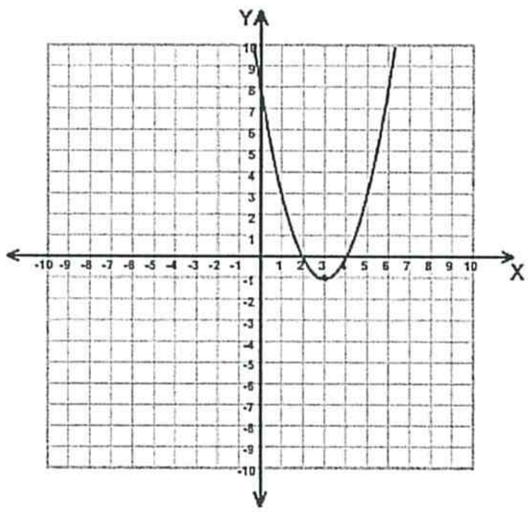
Quadratic Functions – HSF-IF.B.4, HSF-IF.C.7, HSF-IF.C.9, HSA-REI.D.10, HSA-SSE.A.1, HSA-SSE.B.3, HSA-APR.B.3, HSF -IF.C.8, HSA-REI.B.4, HSA -REI.D.10

For 1 – 4,

a) find the y-intercept(s)
b) find the x-intercept(s)/zero(s)/root(s)/solution(s)
c) identify the vertex
d) is the vertex a maximum or a minimum
e) identify the axis of symmetry

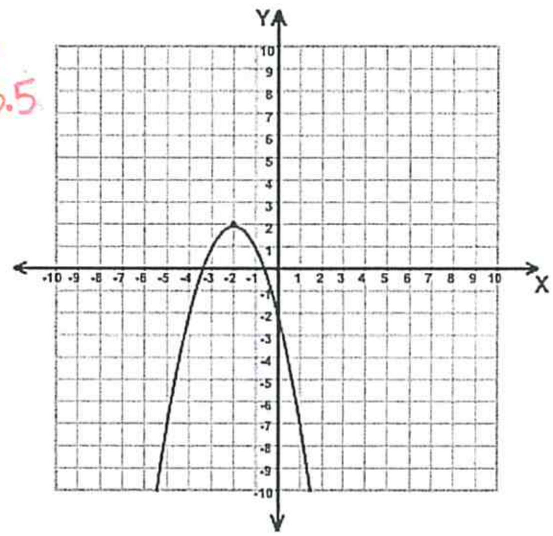
1.

a) (0,8)
b) 2 & 4
c) (3,-1)
d) min.
e) x=3



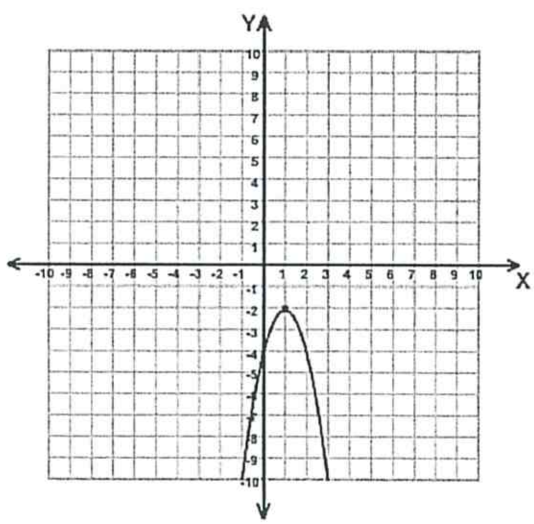
2.

a) (0,-2)
b) -1.5 & 3.5
c) (-2,2)
d) max
e) x=-2



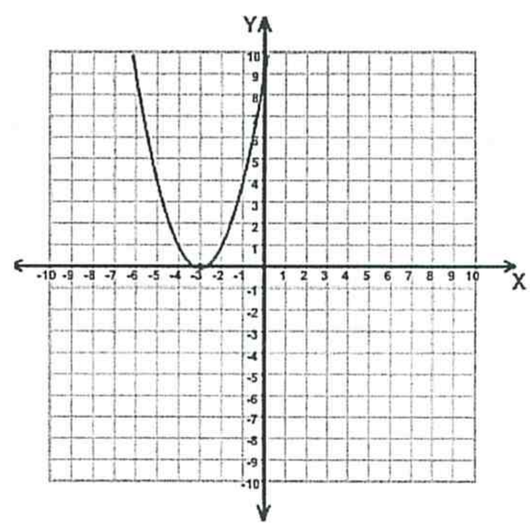
3.

a) (0,-4)
b) None
c) (1,-2)
d) max
e) x=1



4.

a) (0,9)
b) -3
c) (-3,0)
d) min
e) x=-3



Factor each expression for 5 – 8.

5. $6x^5+3x^4-9x^2$

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

6. $49r^2-144$

$(7x+12)(7x-12)$

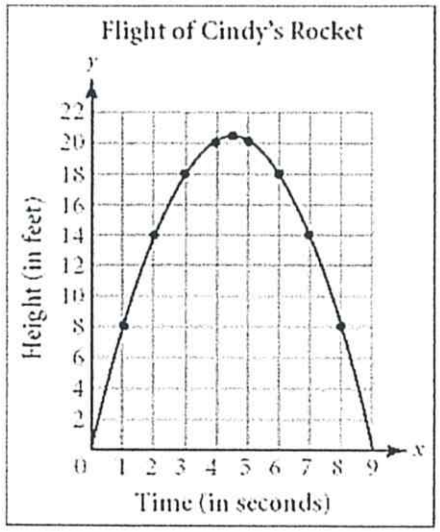
7. $2y^2-2y-112$

$2(x-8)(x+7)$

8. $12d^2-8d+1$

$(2x-1)(6x-1)$

The following is a graph of the path of a rocket after it is launched.



9. Identify and explain the real world meaning of the following points. Height is in feet and time is in seconds.

a) Vertex (4.5, 21) b) x-intercept(s) 0 & 9 c) y-intercept(s) 0

10. How long does it take for the rocket to reach the **ground**?

9 seconds

For 11 - 17, graph each quadratic function. on graphs

11. $y = 3x^2 - 2x - 5$ 12. $y = -x^2 + 4$ 13. $y = x^2 + 4x - 5$ 14. $y = (x-5)(x+2)$

15. $y = \frac{1}{3}(x-1)^2 - 4$ 16. $y = -2(x+5)^2$ 17. $y = (x+1)(x+6)$

18. Explain what can be determined by looking at each form of a quadratic function.

a) Standard $y = ax^2 + bx + c$ b) Factored $y = (x-a)(x-b)$ c) Vertex $y = a(x-h)^2 + k$

max/min y-int x-intercepts max/min vertex(h,k)

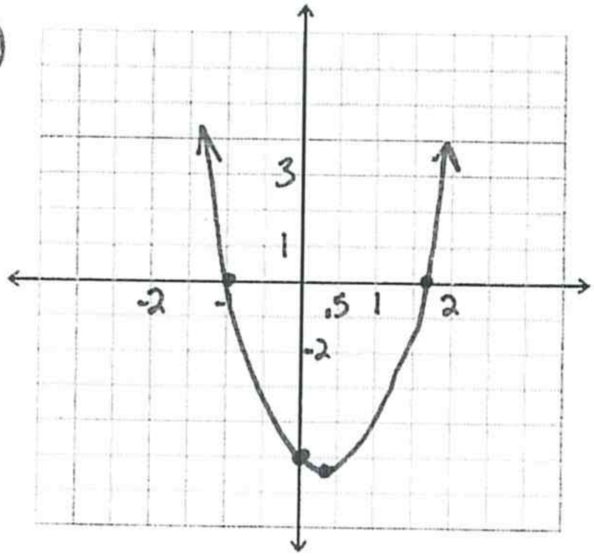
19. Tell the x-intercept(s)/zero(s)/factor(s)/solution(s) of:

a) $f(x) = (x+7)(x-3)$ -7 & 3
b) $f(x) = 2x^2 + 5x - 3$ -3 & 1/2
c) $f(x) = x(2x+5)$ 0 & -5/2
d) $f(x) = 6x^2 + 7x + 2$ -1/2 & -2/3
e) $f(x) = x^2 - x - 12$ -3 & 4
f) $f(x) = 3(4x-3)(x-1)$ 3/4 & 1

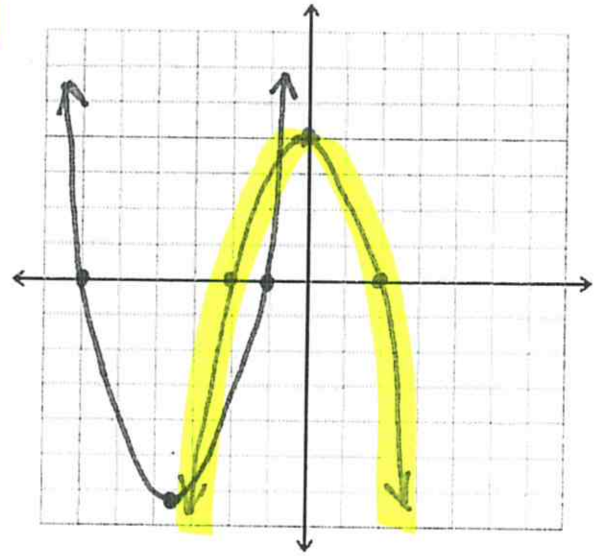
20. Tell the vertex of each, then tell if the vertex is a maximum or a minimum:

a) $f(x) = -5(x+3)^2 - 4$ (-3, -4) max
b) $f(x) = 2x^2 - 4x + 1$ (1, -1) min
c) $f(x) = 3x^2 + 6x - 5$ (-1, -8) min
d) $f(x) = -(x-3)^2$ (3, 0) max
e) $f(x) = x^2 - 1$ (0, -1) min
f) $f(x) = (x-5)^2 + 3$ (5, 3) min

1.)



12.)
17.)



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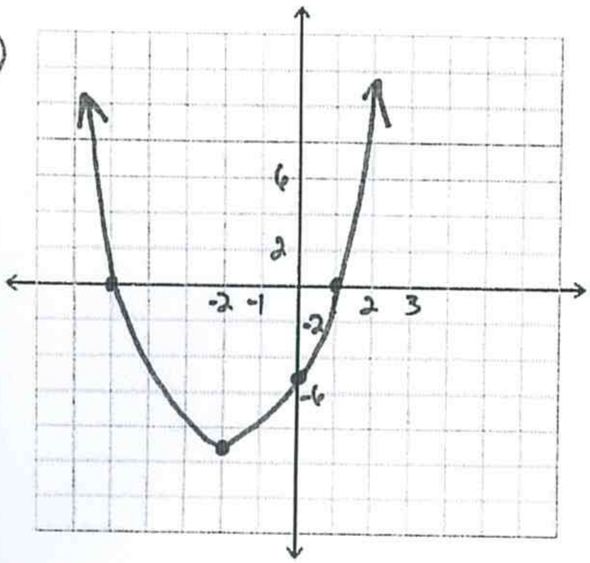

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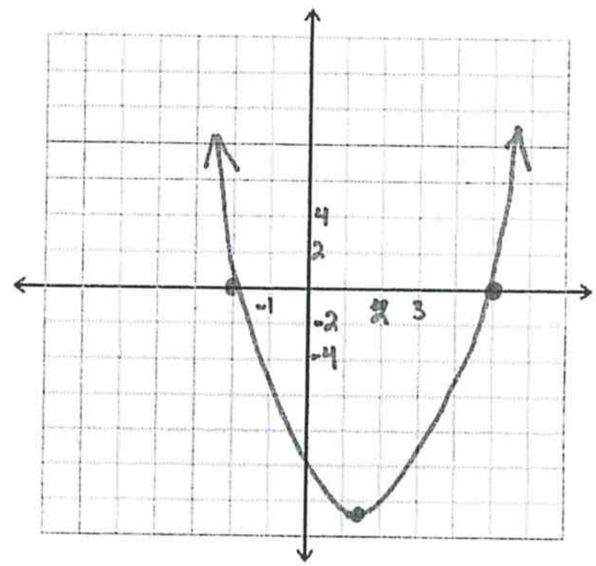

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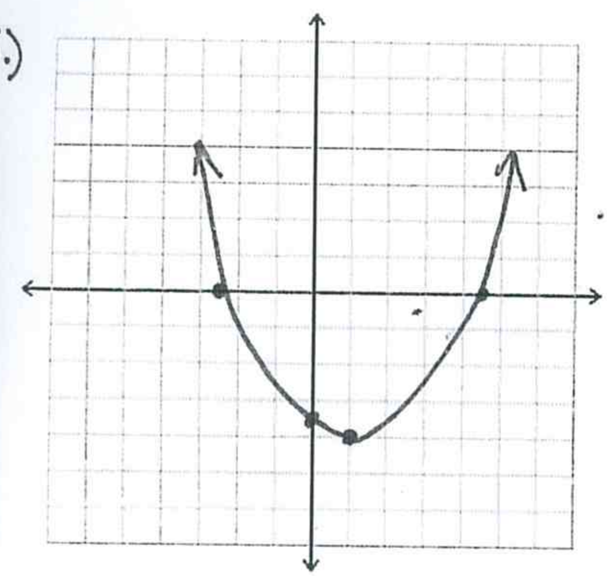
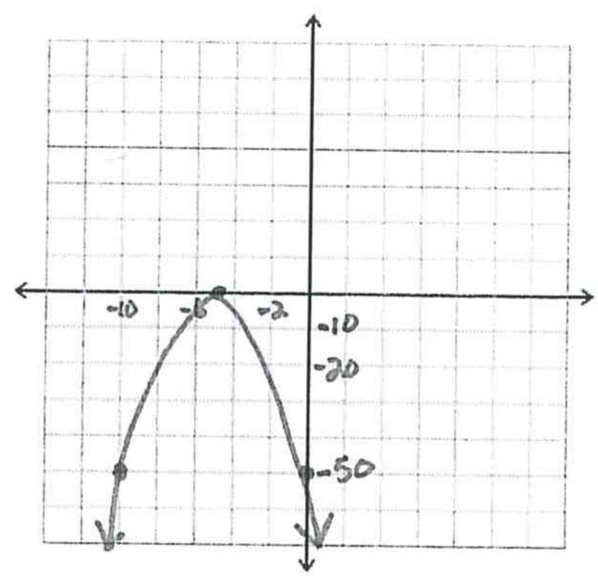


16.)



21. Tell the x- and y-intercepts of each:

a) $f(x) = x^2 - 4x + 2$ x: .586 & 3.41 y: 2

b) $f(x) = x^2 + 6x - 16$ x: 2 & -8 y: -16

c) $f(x) = x^2 - 2x - 24$ x: 6 & -4 y: -24

22. a) What is the vertex of g(x) = $(x - 3)^2 + 2$? (3,2)

Which of the following has the **<u>same vertex</u>** as g(x)? Defend each answer.

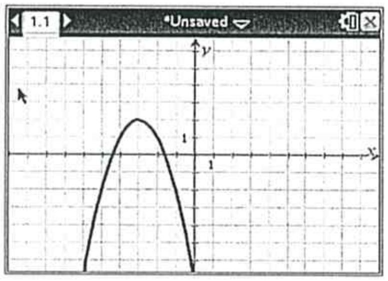
b) h(x) = $-2(x - 3)^2 - 2$

c) f(x) = $(x + 3)^2 + 2$

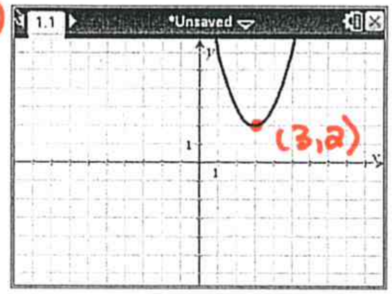
d) p(x) = $x^2 - 6x + 11$

e) q(x) = $(x - 3)(x + 2)$

f)

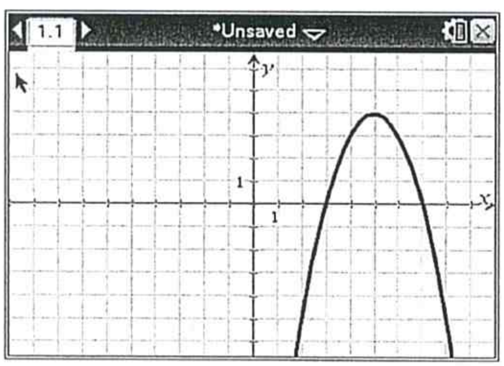


g)



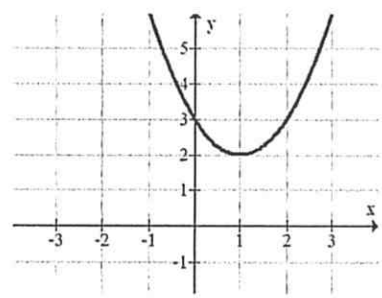
Determine the number of solutions for the following quadratic functions in questions 23 and 24.

23.



2

24.



0

For 25 - 33, round answers to the nearest hundredth if necessary.

25. Find the roots of $4x^2 - 15 = 9$. 2.45 & -2.45

26. Find the zeros of $z^2 + 6z - 27 = 0$. -9 & 3

27. Solve the equation $c^2 - 3c = 0$. 0 & 3

28. Solve $10x^2 - 7x = 33$. -1.5 & 2.2 or -3/2 & 11/5

29. Find all of the zeros of $2x^2 + 15x + 28 = 0$. -4 & -7/2 or -3.5

30. Find the roots of $2x^2 - 7x - 13 = 0$. -1.34 & 4.84

31. Solve $6x^2 + 13x + 6 = 0$. -3/2 & -2/3 or -1.5 & -.67

32. Find the solutions to $2x^2 + 3x - 7 = 0$. -2.77 & 1.27

33. Solve $2x^2 + 4x - 6 = 0$. -3 & 1

Part 3

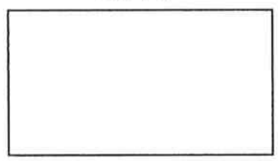
SLOT – HSN-RN.A.2, HSN-RN.B.3, HSA -REI.A.1, HSA -REI.B.3, HSA -APR.A.1, HSN-Q.A.1, HSA-CED.A.4

Find the sum, difference or product of each for 1 – 12.

1. $(4x^2-5x)-2x(2x^2-3x+3)$ $-4x^3+10x^2-11x$
2. $(3p-7)(3p+4)$ $9p^2-9p-28$
3. $(6-3x^2)+(x^3-x+5)$ x^3-3x^2-x+11
4. $-2n^3(n^2-3n+4)$ $-2n^5+6n^4-8n^3$
5. $(2a^2+4c^3)^2$ $4a^4+16a^2c^3+16c^6$
6. $(n^4+2n-1)+(5n-n^4-4)$ $7n-5$
7. $(4x+3)(2x+1)$ $8x^2+10x+3$
8. $(4h^2-5)(5h^2-6)$ $20h^2-49h^2+30$
9. $(2x^3+4x^2+1)(x-4)$ $2x^4-4x^3-16x^2+x-4$
10. $(-4x^2+5x-8)+(-x^2+3x+6)$ $-5x^2+8x-2$
11. $(2x^2-3x-3)-(-6x^2+3x+8)$ $8x^2-6x-11$
12. $(2x^3+4x^2+1)(x-4)$ $2x^4-4x^3-16x^2+x-4$

13. a) Write an expression for the perimeter of the figure below.
    b) Write an expression for the area of the figure below.

$2x+5$

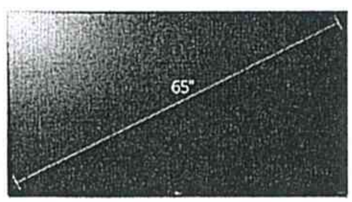


$3x$

$P=10x+10$

$A=6x^2+5x$

14. A 65" television is named by the length of the diagonal of the television.



The Pythagorean Theorem can be used to compare the dimensions to the diagonal: $a^2+b^2=c^2$. You want to know if your new tv will fit in your existing cabinet. Rearrange the formula to solve for height (a). $a=\sqrt{c^2-b^2}$

15. In accounting, a company's gross profit rate measures how well the company controls cost of goods sold to maximize gross profit. The gross profit rate, P, is calculated using the formula $P=\dfrac{S-C}{S}$, where S is the net sales and C is the cost of goods sold. Rearrange the formula to solve for the cost of goods sold C. $C=-SP+S$

16. The surface area, S, of a right circular cylinder is calculated using the formula $S=2\pi r^2+2\pi rh$, where *r* is the radius of the cylinder and *h* is the height of the cylinder. Rearrange the formula to solve for height (*h*). $h=\dfrac{S-2\pi r^2}{2\pi r}$

17. If F denotes a temperature in degrees Fahrenheit and C is the same temperature measured in degrees Celsius, then F and C are related by the equation $F=\dfrac{9}{5}C+32$. Rewrite this equation to solve for C in terms of F. $C=\dfrac{5F-160}{9}$