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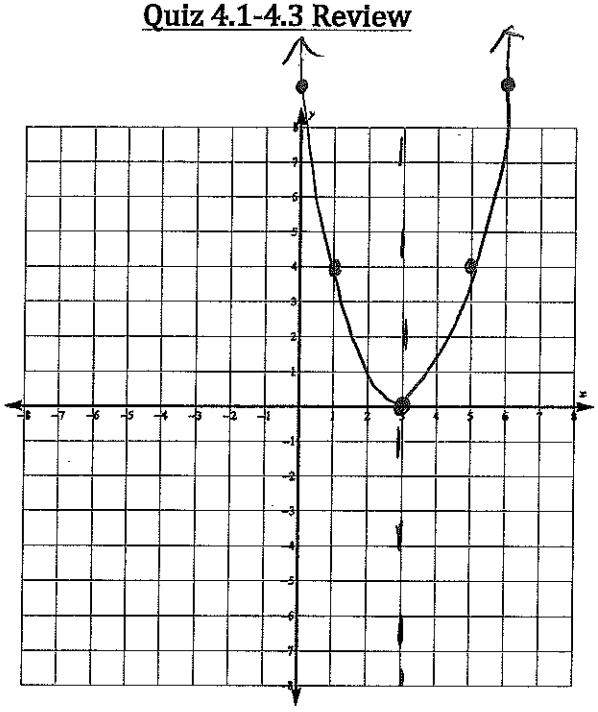
Quadratic Functions and Equations
Quiz 4.1-4.3 Review

1. $y = x^2 - 6x + 9$



$a=1 \quad b=-6 \quad c=9$

$y = x^2 - 6x + 9$

Characteristics	
Axis of Symmetry $x=\frac{-b}{2a}$	$x=\frac{-(-6)}{2(1)}=\frac{6}{2}=3$ $\quad x=3$
Vertex $=\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$	$(3,0)$ $\quad y=(3)^2-6(3)+9=0$
y-intercept $(0,c)$	$(0,9)$
Point symmetric to y-intercept	$(6,9)$
Direction it opens	up a is positive
Domain	D: $\mathbb{R}$ OR D: $(-\infty,\infty)$
Range	R: $y \geq 0$ OR R: $[0,\infty)$

a is positive

y coordinate of vertex

need another point. 2

1	$1^2-6(1)+9=4$
3	0

→ If a is neg it opens down

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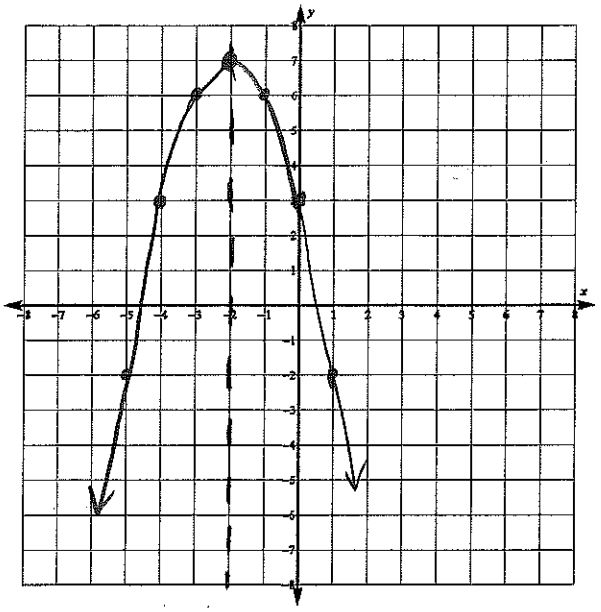
2. $y = -x^2 - 4x + 3$

$a = -1$

$b = -4$

$c = 3$



Characteristics	
Axis of Symmetry	$x = \frac{-b}{2a}$ $x = \frac{-(-4)}{2(-1)} = \frac{4}{-2} = -2$ $x = -2$
Vertex	$\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$ $f(-2) = -(-2)^2 - 4(-2) + 3$ $= -4 + 8 + 3$ $= 7$ $(-2, 7)$
y-intercept	$(0, c)$ $(0, 3)$
Point symmetric to y-intercept	$(-4, 3)$
x-intercept(s)	Find point it crosses x-axis or between integers $f(1) = -(1)^2 - 4(1) + 3$ $= -1 - 4 + 3$ $= -2$ $(1, -2)$ ← point symmetric: $(-5, -2)$ between -5 & -4 and between 0 & 1
Domain	$D: \mathbb{R}$ or $D: (-\infty, \infty)$
Range	$R: y \leq 7$

← one more point

-3	6
-2	7
-1	$-(-1)^2 - 4(-1) + 3 = 6$

a is negative

y coordinate of vertex

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Find the solution to the following equations by factoring.

3. $x^2 - 10x - 39 = 0$

① GCF? → no
② Proceed w/ basic factoring

-39	+ -10
1, -39	-38 X
3, -13	-10 ✓

a=1 so just write factors

$(x+3)(x-13)=0$

$x=-3 \quad x=13$

4. $2x^2 - 6x - 56 = 0$

① GCF? → 2
② $2(x^2-3x-28)=0$
③ Proceed w/ basic factoring b/c a=1 inside parenthese

-28	+ -3
-2, 14	12 X
4, -7	-3

$2(x+4)(x-7)=0$

$x=-4 \quad x=7$

5. $x^2 - 81 = 0$

① GCF? → no
② not a trinomial so check for perfect squares. $\sqrt{x^2}=x \quad \sqrt{81}=9$ ✓
③ use $a^2-b^2=(a+b)(a-b)$

$(x)^2-(9)^2=$

$(x+9)(x-9)$

$x=-9 \quad x=9$

6. Find the zeros of the equation $2x^2 - 15x = 8$ → solve must =0

$2x^2-15x-8=0$

① GCF? → no
② Proceed to factor by grouping b/c a=2.

A. $x=-\frac{1}{2}, x=8$

B. $x=-1, x=8$

C. $x=\frac{1}{2}, x=-8$

D. $x=1, x=-8$

$2x^2-15x-8=0 \quad a\cdot c = 2\cdot -8 = -16$

-16	+ -15
2, -8	-6 X
4, -4	0 X
1, -16	-15 ✓

$2x^2+1x-16x-8=0$

$(2x^2+1x)(-16x-8)=0$

$x(2x+1)-8(2x+1)=0$

$(2x+1)(x-8)=0$

$2x+1=0 \quad x=8$

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

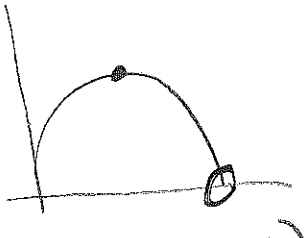
7. You are playing a lawn version of tic-tac-toe in which you toss bean bags onto a large board. One of your tosses can be modeled by the function $y=-0.12x^2+1.2x+2$, where x is the bean bag's horizontal position (in feet) and y is the corresponding height (in feet). What is the bean bag's maximum height?

A. 2.5 feet

B. 5 feet

C. 6 feet

D. 10 feet



$x=\frac{-(1.2)}{2(-.12)}=\frac{-1.2}{-.24}=5$

$y=-.12(5)^2+1.2(5)+2$

$y=5$

Vertex: $\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$

$(5, 5)$

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8. An equation $y = 2(x-3)(x+4)$ is given in Intercept Form, which of the following is a representation of the same equation in Standard Form.

$y = 2(x-3)(x+4)$ FOIL 1st

A. $y = 2x^2 + 5x + 12$

B. $y = 2x^2 + 2x - 24$ $y = 2(x^2 + 4x - 3x - 12)$

$y = 2(x^2 + x - 12)$

C. $y = 2x^2 + 3x + 12$

D. $y = 2x^2 + 5x - 24$ $y = 2x^2 + 2x - 24$

9. The height, h (in feet) of a volleyball t seconds after it is hit can be modeled by $h = -16t^2 + 48t + 4$. What is the volleyball's maximum height.

vertex

① algebra:

$x = \frac{-b}{2a} = \frac{-48}{2(-16)} = 1.5$

$f(1.5) = -16(1.5)^2 + 48(1.5) + 4$

$= 40$

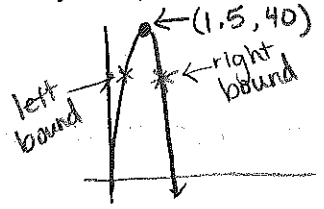
(1.5, 40)

At 1.5 sec the volleyball is 40 ft. high.

↑ max height

Calc: y= , adjust window

2nd Trace maximum



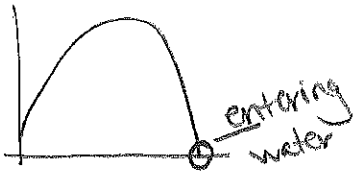
10. Gregg is diving into a pool from a spring board 4 feet above the water. This jump can be modeled by the equation $h(t) = -2t^2 + 4t + 3$, where h is the height above the water and t is time in seconds. The point where Gregg enters the water can be represented by what?

A. Vertex

B. y-intercept

C. x-intercept

D. axis of symmetry



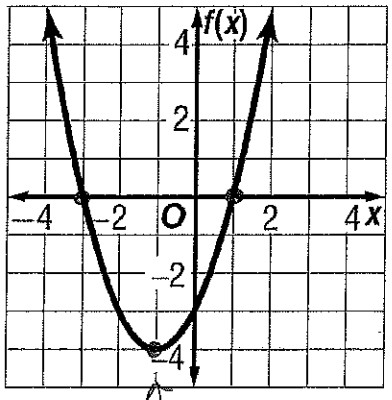
11. Which function is graphed?

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

B $f(x) = x^2 + 2x - 3$ $x = \frac{-(2)}{2(1)} = -1$

C $f(x) = x^2 + x - 3$ $x = \frac{-(1)}{2(1)} = -\frac{1}{2}$

✗ **D** $f(x) = (x-3)^2$ ← wrong y int



← y intercept: (0, -3)

What are the zeros of the function?

(-3, 0) & (1, 0)

↑ vertex: $\frac{-b}{2a} = -1$

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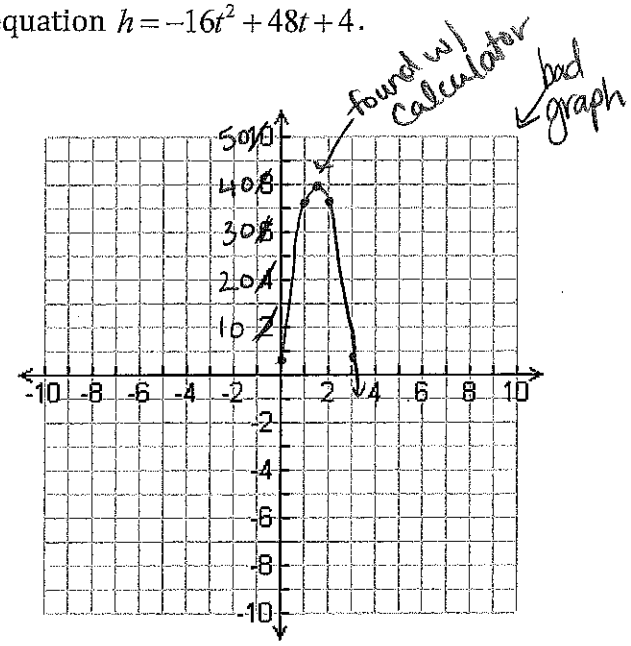
12. A juggler tosses a ball into the air modeled by the equation $h = -16t^2 + 48t + 4$.

What is the maximum (vertex) height that the ball reaches? When does this occur?

Vertex → (1.5, 40) the ball is 40ft

at 1.5 seconds



If the juggler misses the ball at what time will it hit the floor? Round the time to 2 decimal places.

zero

(3.081, 0) after 3.08 seconds the ball hits the floor

What does the floor represent in this problem modeled by the graph?

X axis

13. By the Zero Product Property, if $(2x - 1)(x - 5) = 0$, then what does x equal?

$a \cdot b = 0$, $a = 0$ or $b = 0$

F $x = 1$ or $x = 5$

H $x = \frac{1}{2}$ or $x = 5$

G $x = -\frac{1}{2}$ or $x = -5$

J $x = -1$ or $x = -5$

$2x - 1 = 0$ $\quad x - 5 = 0$

$2x = 1$ $\quad x = 5$

$x = \frac{1}{2}$

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14. Write a quadratic equation with 7 and $\frac{2}{5}$ as its roots.
Write the equation in the form $ax^2 + bx + c = 0$, where a, b, and c are integers.

$(x-7)(x-\frac{2}{5}) \rightarrow (x-7)(5x-2)$

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

$5x^2 - 37x + 14$

A $5x^2 - 37x + 14 = 0$ **C** $5x^2 + 37x + 14 = 0$

B $2x^2 + 9x - 35 = 0$ **D** $2x^2 - 9x - 35 = 0$

15. Solve $x^2 + 6x = -6$. If exact roots cannot be found, state the consecutive integers between which the roots are located. $x^2+6x+6=0$ → try to factor

•6	+6
2,3	5 ✗
1,6	7 ✗

↓ Can't factor

A –2, –3 **C** between –4 and –3; between –2 and –1

B –3 **D** between –5 and –4; between –2 and –1

x	y	
–5	1	> 0 is b/w
–4	–2	
–2	–2	> 0 is b/w
–1	1	

← * use calc + look at graph + table!

So somewhere b/w $x=-5$ & $x=-4$ and $x=-2$ & $x=-1$ there are solutions or roots.

16. Determine whether $f(x) = \frac{1}{2}x^2 - x - 9$ has a maximum or a minimum value and find that value.

up b/c a is positive

minimum

(1, –9.5)

minimum $y = -9.5$

Vertex $\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$

$x = \frac{-(-1)}{2(\frac{1}{2})} = \frac{1}{1} = 1$

$y = \frac{1}{2}(1)^2 - (1) - 9$

$y = \frac{1}{2} - 1 - 9 = -9.5$

For Questions 17 and 18, solve each equation by factoring.

17. $x^2 - 7x = 18$

no GCF so go → $x^2 - 7x - 18 = 0$

$(x+2)(x-9) = 0$

$x = -2$ $x = 9$

•–18	+–7	
3, –6	–3	✗
2, –9	–7	✓

18. $4x^2 = x$

$4x^2 - x = 0$

GCF: x So factor it out 1st.

$x(4x-1) = 0$

$x = 0$ $4x - 1 = 0$

$4x = 1$

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