Name Solns

Quadratics: Topic 2 Review Sheet

1. What is the equation in vertex form of a parabola with a vertex of (2, -6) that passes through (11, 21)?

h k x y

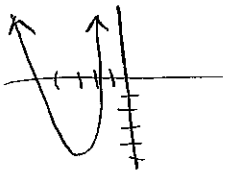
$21 = a(11-2)^2 - 6$

$27 = a(81)$

$a = \frac{27}{81} = \frac{1}{3}$

$\boxed{y = \frac{1}{3}(x-2)^2 - 6}$

2. Function g is a transformation of the parent function $f(x) = x^2$. The graph of g is a translation left 4 units and down 5 units of the graph of f. Write the equation for g in the form $y = ax^2 + bx + c$.



$y = (x+4)^2 - 5$

$= (x+4)(x+4) - 5$

$= x^2 + 8x + 16 - 5$

$\boxed{y = x^2 + 8x + 11}$

3. What is the vertex of the graph of the function $f(x) = x^2 - 12x$?

$x = \frac{-b}{2a} = \frac{-(-12)}{2 \cdot 1} = \frac{12}{2} = 6$ (6, -36)

$y = (6)^2 - 12(6) = -36$

4. The path of a projectile launched from a 24-ft-tall tower is modeled by the equation $y = -16x^2 + 32x + 24$. Graph the equation. What is the maximum height, in feet, reached by the projectile? Also identify the vertex, x-int, & y-int.

~~x~~ can be found on calc!

y-int = 24

Vertex: $x = \frac{-b}{2a}$ $y = -16(1)^2 + 32 + 24$

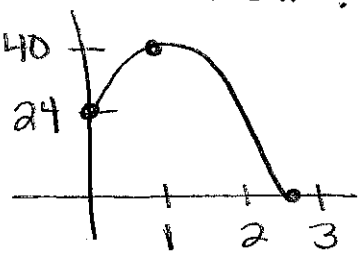
$x = \frac{-32}{2(-16)} = 1$ $= 40$

V (1, 40)

x-int: $\frac{-32 \pm \sqrt{(32)^2 - 4(-16)(24)}}{2(-16)}$ 40

$= \frac{-32 \pm \sqrt{2560}}{-32}$

~~-.58~~, 2.58



5. Use quadratic regression to find a quadratic equation that fits the given points.

x	1	2.3	6	5	0
y	-1.3	-8.528	-88.3	-58.1	-3.1

L1 | L2

$y = -3.2x^2 + 5x - 3.1$

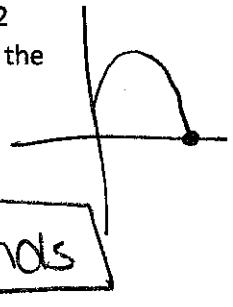
6. Solve the equation $x^2 - x = 12$

$x^2 - x - 12 = 0$

$(x-4)(x+3) = 0$ $\quad x = 4, -3$

$x - 4 = 0, \; x + 3 = 0$

7. A ball is thrown from the top row of seats in a stadium. The function $h(t) = -16t^2 + 64t + 2$ gives the height, in feet, of the ball t seconds after it is thrown. How long will it be before the ball hits the ground?



x-int

$0 = -16t^2 + 64t + 2$

Find on calculator

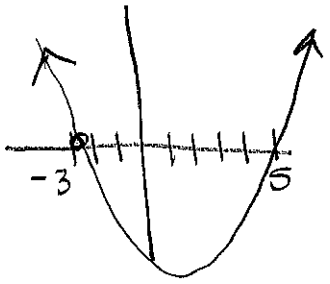
4.03 seconds

8. Identify the interval(s) on which the function $y = x^2 - 2x - 15$ is:

$(x-5)(x+3)$

a. Negative

$-3 < x < 5$



b. Positive

$x < -3$ or $x > 5$

9. Use square roots to solve the equation $x^2 = -144$ over the complex numbers.

$\sqrt{x^2} = \sqrt{-144}$

$x = 12i, -12i$

10. Write in the form $a + bi$:

a. $6i(8 - 5i)$

$48i - 30i^2$

$48i + 30$

or

$30 + 48i$

b. $\frac{5}{(3-i)} \cdot \frac{(3+i)}{(3+i)}$

$\frac{15+5i}{9+3i-3i-i^2} = \frac{15+5i}{10} = \frac{3+i}{2}$

$+1$

or

$\frac{3}{2} + \frac{1}{2}i$

11. Factor the expression: a. $x^2 + 49$ b. $4x^2 + 121$

$x^2 - (-49)$ $\quad$ $4x^2 - (-121)$

$(x+7i)(x-7i)$ $\quad$ $(2x+11i)(2x-11i)$

12. Solve $0 = x^2 - 2x + 26$ by completing the square. Then solve using quadratic formula

$0 = x^2 - 2x + 1 + 26 - 1$

$\left(\frac{-2}{2}\right)^2$ $\quad$ $(-1)^2$ $\quad$ 1

$0 = (x-1)^2 + 25$

$\sqrt{-25} = \sqrt{(x-1)^2}$

$x - 1 = \pm 5i$

$\boxed{x = 1 \pm 5i}$

$\frac{2 \pm \sqrt{(-2)^2 - 4 \cdot 1 \cdot 26}}{2 \cdot 1}$

$\frac{2 \pm \sqrt{-100}}{2} = \frac{2 \pm 10i}{2} = \boxed{1 \pm 5i}$

13. A function is defined by the equation $y = x^2 - 9x + 18$. Which statements are true? Select all that apply.

Vertex: $\frac{-b}{2a} = \frac{9}{2 \cdot 1} = \frac{9}{2} = x$ $\quad$ $V\left(\frac{9}{2}, \frac{-9}{4}\right)$

$y = \left(\frac{9}{2}\right)^2 - 9\left(\frac{9}{2}\right) + 18 = \frac{-9}{4}$

Vertex is at $\left(\frac{9}{2}, -\frac{9}{4}\right)$ ✓	The equation written in vertex form is: $y = \left(x + \frac{9}{2}\right)^2 - \frac{9}{4}$	The graph has a minimum at y = $-\frac{9}{4}$ at x = $\frac{9}{2}$ ✓	The domain is all real numbers ✓	The range is all real numbers

No! $y = \left(x - \frac{9}{2}\right)^2 - \frac{9}{4}$

No, range is $[-9/4, \infty)$

14. Solve using the Quadratic Formula:

a. $x^2 + 6x + 10.25 = 0$

$\frac{-6 \pm \sqrt{(6)^2 - 4 \cdot 1 \cdot 10.25}}{2 \cdot 1}$

$\frac{-6 \pm \sqrt{-5}}{2} = \boxed{\frac{-6 \pm i\sqrt{5}}{2}}$

b. Solve $x^2 - 8x + 13 = 0$

$\frac{8 \pm \sqrt{(-8)^2 - 4 \cdot 1 \cdot 13}}{2 \cdot 1}$

$\sqrt{12}$ $\quad$ $\sqrt{4 \cdot 3}$ $\quad$ $2\sqrt{3}$

$\frac{8 \pm \sqrt{12}}{2} = \frac{8 \pm 2\sqrt{3}}{2}$

$= \boxed{4 \pm \sqrt{3}}$

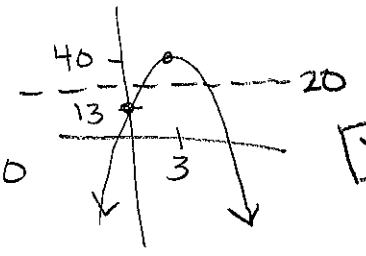
15. A model airplane is launched from a cannon on top of a platform. The equation $h(t) = -3t^2 + 18t + 13$ gives the height h, in meters, of the plane t seconds after it is launched. Does the plane reach a height of 20 m?

Option 1: Find vertex + make sketch

$= \frac{-18}{2(-3)} = 3$

$y = -3(3)^2 + 18(3) + 13 = 40$

$(3, 40)$



Yes

option 2: Set $h(t) = 20$ + determine, using discriminant, if there are real solns

$20 = -3t^2 + 18t + 13$

$0 = -3t^2 + 18t - 7$

$(18)^2 - 4(-3)(-7)$

240

Positive → 2 real solns

Yes

16. What value(s) of b will cause $3x^2 + bx + 3 = 0$ to have one real solution?

a c

discriminant is equal to 0

$b^2 - 4ac = 0$

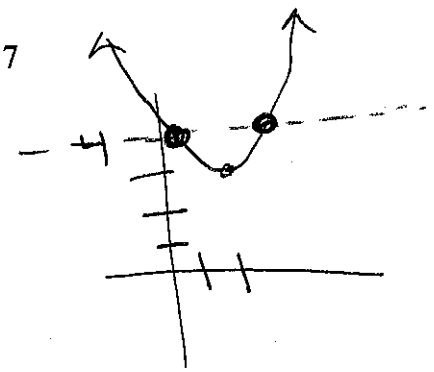
$b^2 - 4(3)(3) = 0$

$b^2 - 36 = 0$

$b^2 = 36$

$b = 6, -6$

17. Determine the number of real solutions of the system: $\begin{cases} y = x^2 - 4x + 7 \\ y = 4 \end{cases}$



Sketch + count intersection pts.

2

18. Solve $2x^2 + 16x - 29 = \frac{1}{2}x - 5$ by writing a linear-quadratic system and solving using the intersection feature on your calculator. At approximately what two values of x do the curves intersect?

$x = 1.323$

$x = -9.073$

$y_1 = 2x^2 + 16x - 29$

$y_2 = 1/2x - 5$

look for intersection pts!