Name: Key Date:

"The Parabolic Test"

1. The Orange Bird and the Blue Bird were having a contest to see who could go the highest on the new sling shot. The Orange Bird went first and his height in meters above the ground can be modeled by $h(s) = -4.9s^2 + 14.7s$ where s is the time in seconds.

   a) At what time did Orange Bird reach his maximum height? Finding x-value of maximum
   Orange Bird reached his maximum height at 1.5 seconds
   2nd | Trace | 4 | max
   max = (1.5, 11.025)

   b) How long did the Orange Bird travel before he hit the ground?
   Orange Bird travel for 3 seconds before he hit the ground
   Finding zero
   2nd | Trace | 2 | zero

   c) Identify the domain and range.
   D: $(-\infty, \infty)$
   R: $(-\infty, 11.025]$ ← only use brackets for domain and range

2. The King Pig was trying to play a joke on the Black bird by trying to jump on him from a tree. His height in the air can be represented by the function $h(d) = -16d^2 + 30d + 5$ where d is the distance in feet.

   a) What was King Pig's maximum height? → Same method as #1a but looking at y-value instead
   max = (.937, 19.0625)
   King Pig's maximum's height is 19.0625 feet

   b) If Black Bird is 3 feet away from the tree, will King Pig hit him? Same method as #1b
   NO, King Pig will fall short by landing only at 2.029 feet
   looking for zero
   X = 2.029

   c) ~~Describe~~ Identify the domain and range for this scenario.
   D: $(-\infty, \infty)$
   R: $(-\infty, 19.06]$

3. The pigs are at it again! Help the King Pig and Little Pig in their tournament by solving each set of quadratics. SHOW ALL YOUR WORK!!!

   King Pig—Solve through the
   a) $3x^2 + 20x - 7 = 0$
   $\frac{-20 \pm \sqrt{(20)^2 - 4(3)(-7)}}{2(3)}$
   $-20 \pm \sqrt{484}/6$
   $400 + 48$
   $\frac{-20 \pm 22}{6}$
   $\frac{-20+22}{6} = \frac{1}{3}$
   $\frac{-20-22}{6} = -7$

   Little Pig—Solve through Factoring
   b) $2x^2 - 13x + 20 = 0$
   40 −8, −5
   $2x^2 - 8x - 5x + 20 = 0$
   $2x(x-4) - 5(x-4)$
   $(2x-5)(x-4) = 0$
   $2x - 5 = 0$ $x - 4 = 0$
   $x = \frac{5}{2}$ & 4

Name: Date:

b) $5x^2 - 2x + 1 = 0$

$\frac{2 \pm \sqrt{(-2)^2 - 4(5)(1)}}{2(5)}$

$= \frac{2 \pm \sqrt{4 - 20}}{10} = \frac{2 \pm \sqrt{-16}}{10}$

$= \frac{2 \pm 4i}{10} = \boxed{\frac{1 \pm 2i}{5}}$

c) $2x^2 + 5x + 4 = 0$

$\frac{-5 \pm \sqrt{(5)^2 - 4(2)(4)}}{2(2)}$

$= \frac{-5 \pm \sqrt{25 - 32}}{4} = \frac{-5 \pm \sqrt{-7}}{4}$

$= \boxed{\frac{-5 \pm i\sqrt{7}}{4}}$

e) $\sqrt[3]{27x^3} + 1 = 0$ a^2 ab b^2

could use Quad. Formula

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

S O AP

$3x + 1 = 0$ $9x^2 - 3x + 1 = 0$

$3x = -1$

$\boxed{x = -1/3}$

f) $x^3 + 3x^2 - 6x - 18 = 0$

$x^2(x+3) - 6(x+3) = 0$

$(x^2 - 6)(x + 3) = 0$

$x^2 - 6 = 0$ $x + 3 = 0$

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

$\boxed{x = \pm\sqrt{6}}$

Who ended up with the highest **real** zero? Little Pig

3d → 4 as a solution

4. Darth Vader Pig now wants a crack at the tournament. Solve by completing the square and then determine if any of his solutions are higher.

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

a) $2r^2 + 4r - 66 = 0$

$2r^2 + 4r = 66$

$2(r^2 + 2r + 1) = 66 + 2$

$2(r+1)^2 = 68$

$(r+1)^2 = 66$

$r + 1 = \pm\sqrt{66}$ $\boxed{r = -1 \pm \sqrt{66}}$

$\left(\frac{10}{2}\right)^2 = 5^2 = 25$

b) $m^2 + 10m + 14 = -7$

$m^2 + 10m = -21$

$+25 \quad +25$

$m^2 + 10m + 25 = 4$

$\sqrt{(m+5)^2} = \sqrt{4}$

$m + 5 = \pm 2$

$m = -5 \pm 2$

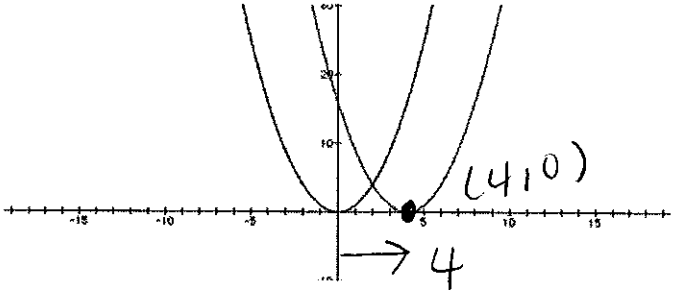
$-5 + 2 = -3$

$-5 - 2 = -7$

5. The Yellow Bird and Red Bird are playing with a new swing set. If the Red Bird's path is the same as the parent function, then what is the Yellow Bird's path expressed in

Vertex Form? $(x-4)^2$ $(x-4)(x-4)$ FOIL

What about in Standard Form? $x^2 - 8x + 16$



Name: Date:

6. What is an equation for a parabola that reflected over the x-axis, shifted down four units and three to the left from its parent function?

Vertex Form: $-(x+3)^2-4$ Standard Form: $-x^2-6x-13$

Vertex $(-3,-4)$

$-(x+3)(x+3)-4$

$-(x^2+6x+9)-4$

$-x^2-6x-9-4$

$-x^2-6x-13$

7. Blue bird and his imaginary bird friends need help simplifying:

a) $-i^8$

$-(i\,i\,i\,i \mid i\,i\,i\,i)$

$-(1)(1)$

$-(1)$

$\boxed{-1}$

b) $\dfrac{(2+3i)(1+5i)}{(1-5i)(1+5i)}$

$\dfrac{2+10i+3i+15i^2}{1+5i-5i-25i^2}$ (-1) (-1)

$=\dfrac{2+13i-15}{1+25}$

$=\dfrac{-13+13i}{26}$

$=\boxed{\dfrac{-1+i}{13}}$

c) $(5-7i)-(3-2i)$

$5-7i-3+2i$

$\boxed{2-5i}$

d) $(1+2i)(3-2i)$

$3-2i+6i-4i^2$ (-1)

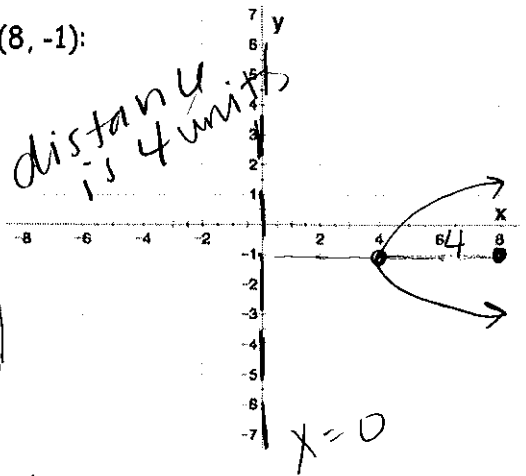
$3+4i+4$

$\boxed{7+4i}$

8. Graph the parabola that has a vertex of (4, -1) and focus of (8, -1):

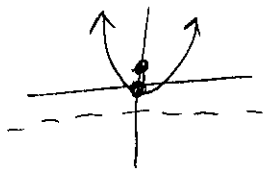
a) What is the directrix? $\boxed{x=0}$

b) What is the equation for this parabola in vertex form?



$a=\dfrac{1}{4d}=\dfrac{1}{4(4)}=\dfrac{1}{16}$ $\boxed{x=1/16(x+1)^2+4}$

9. What is the equation of a parabola who has a focus at (0, 1) and a directrix at y = -1?



vertex (0,0)

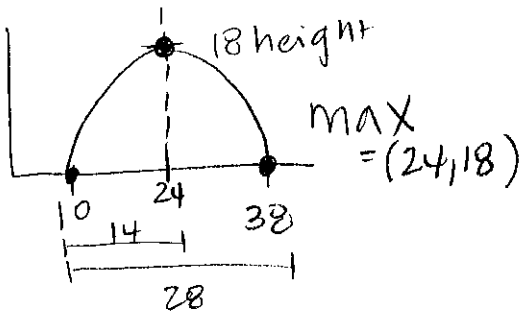
$d=1$ unit

$\boxed{y=1/4\,x^2}$

$a=\dfrac{1}{4(1)}=\dfrac{1}{4}$

Name: Date:

10. Red Bird starts his flight from point (10, 0). His flight path reaches a maximum height of 18 yards and lands at point (38, 0).



a) What is the standard form equation?

$y = -.091x^2 + 4.408x - 34.898$

b) What is the axis of symmetry?

$x = 24$

c) Identify the relative extrema.

max = (24, 18)

11. Yellow Bird's flight path can be modeled by the quadratic equation $y = -x^2 + 14x - 24$.

a) What are the roots? Finding zeros! means to list

$x = 2 \& 12$ or $\{2, 12\}$

b) At what times will Red Bird reach a height of 11 yards?

3.26 & 10.74 seconds

c) Write the equation into vertex form. max = (7, 25)

$y = -(x+7)^2 + 25$

12. The table below contains partial data points of Blue Birds trajectory.

X	12	13	14	15	16	17	18	19	20	21	22	23	24
y	0	11	20	27	32	35	36	35	32	27	20	11	0

vertex

solution solution

a) What are the solutions to this function?

$x = 12 \& 24$ or $\{12, 24\}$

b) Write the standard form equation for this set of data.

$y = -x^2 + 36x - 288$

c) Identify the domain and range for the entire function.

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

R: $(-\infty, 36]$