

2.4

Algebra 2: Notes
Writing Quadratic Equations

Key

Writing Quadratic Equations

Given a point and the vertex (h, k) Use vertex form: $y = a(x - h)^2 + k$ Given a point and the x-intercepts p and q Use intercept form: $y = a(x - p)(x - q)$

Given three points

Write and solve a system of three equations in three variables.

Ex 1) The graph shows the parabolic path of a performer who is shot out of a cannon, where y is the height (in feet) and x is the horizontal distance traveled (in feet).

a) Write an equation of the parabola.

$$y = -.008(x - 50)^2 + 35$$

b) The performer lands in a net ^(*) 90 feet from the cannon. What is the height of the net?

a) given point + vertex so use vertex form:

$$y = a(x - h)^2 + k$$

$$15 = a(0 - 50)^2 + 35$$

$$15 = a(-50)^2 + 35$$

$$15 = a(2500) + 35$$

$$\underline{-35} \quad \underline{-35}$$

$$\underline{-20} = \underline{a(2500)}$$

$$\underline{2500} \quad \underline{2500}$$

$$-.008 = a$$

sub x, y, h, k into eq
solve for a

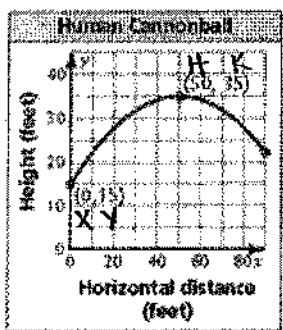
$$b) y = -.008(90 - 50)^2 + 35$$

$$y = -.008(40)^2 + 35$$

$$y = -.008(1600) + 35$$

$$y = -12.8 + 35$$

$$y = 22.2 \text{ feet}$$



P1) Write an equation of the parabola that passes through the point $(-1, 2)$ and has vertex $(4, -9)$.

$$2 = a(-1 - 4)^2 - 9$$

$$2 = a(-5)^2 - 9$$

$$2 = a(25) - 9$$

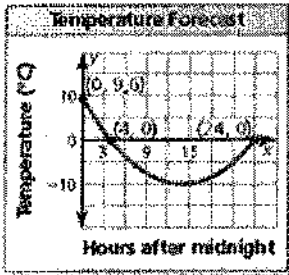
$$11 = a(25)$$

$$.44 = a$$

$$y = .44(x - 4)^2 - 9$$

Ex 2) A meteorologist creates a parabola to predict the temperature tomorrow, where x is the number of hours after midnight and y is the temperature (in degrees Celsius).

a) Write a function f that models the temperature over time. What is the coldest temperature?



given x -intercepts and a point so use intercept form $y = a(x-p)(x-q)$

x -int: $p=4$ $q=24$ $x=0$ $y=9.6$

$$9.6 = a(0-4)(0-24)$$

$$9.6 = a(-4)(-24)$$

$$9.6 = a(96)$$

$$.1 = a$$

$$y = .1(x-4)(x-24)$$

Coldest temp is the minimum value
So find vertex:

$$x = \frac{p+q}{2} \quad x = \frac{4+24}{2} = \frac{28}{2} = 14$$

$$y = .1(14-4)(14-24)$$

$$y = .1(10)(-10)$$

$$y = -1(-100)$$

$$y = -10$$

So coldest temp is -10°C at 14 hours after midnight, or 2pm

P2) Write an equation of the parabola that passes through the point $(2, 5)$ and has x -intercepts at -2 and 4 .

$$x=2 \quad y=5 \quad p=-2 \quad q=4$$

$$5 = a(2+2)(2-4)$$

$$5 = a(4)(-2)$$

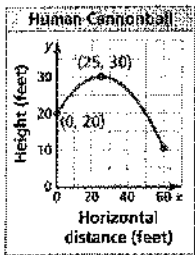
$$5 = a(-8)$$

$$-\frac{5}{8} = a$$

$$y = -\frac{5}{8}(x+2)(x-4)$$

Partner Practice:

P3) The graph shows the parabolic path of a performer who is shot out of a cannon, where y is the height (in feet) and x is the horizontal distance traveled (in feet). Write an equation of the parabola. The performer lands in a net 60 feet from the cannon. What is the height of the net to the nearest foot?



$$h=25 \quad k=30 \quad x=0 \quad y=20$$

$$y = a(x-h)^2 + k$$

$$20 = a(0-25)^2 + 30$$

$$20 = a(625) + 30$$

$$-10 = a(625)$$

$$-.016 = a$$

$$y = -.016(x-25)^2 + 30$$

Net is 10.4 feet high

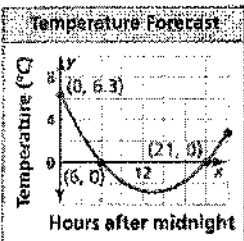
$$y = -.016(60-25)^2 + 30$$

$$y = -.016(35)^2 + 30$$

$$y = -.016(1225) + 30$$

$$y = -19.6 + 30$$

$$y = 10.4$$



P4) The meteorologist creates a parabola to predict the temperature the day after tomorrow, where x is the number of hours after midnight and y is the temperature (in degrees Celsius). Write a function f that models the temperature over time. What is the coldest min (vertex) temperature?

$$p=6 \quad q=21 \quad x=0 \quad y=6.3$$

$$6.3 = a(0-6)(0-21)$$

$$6.3 = a(-6)(-21)$$

$$6.3 = a(126)$$

$$.05 = a$$

$y = .05(x-6)(x-21)$
Coldest temp is about -2.8°C 13.5 hrs after midnight or 1:30pm

$$\frac{6+21}{2} = \frac{27}{2} = 13.5$$

$$y = .05(13.5-6)(13.5-21)$$

$$y = .05(7.5)(-7.5)$$

$$y = .05(-56.25)$$

$$y = -2.8125$$