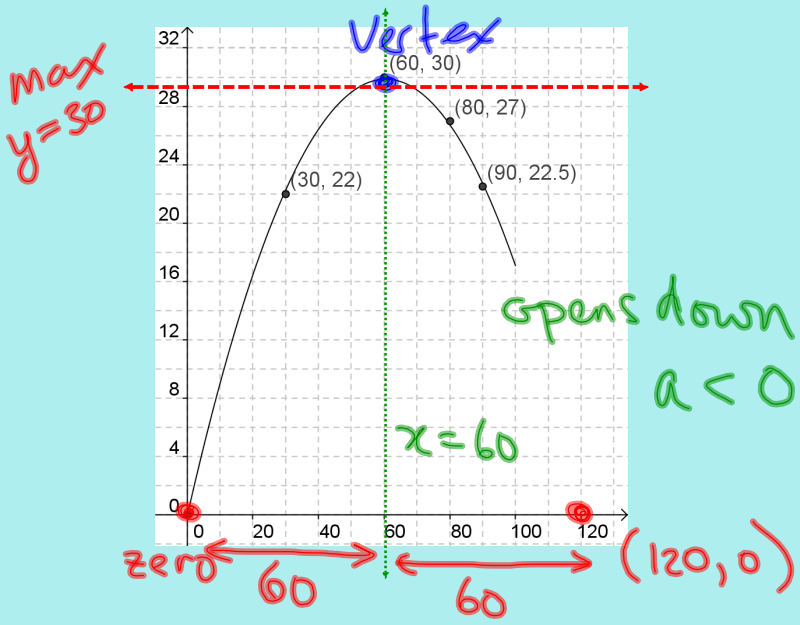
Data from the flight of a golf ball are graphed below. Identify key features that could be used to model the path using factored form or standard form.

$y = a(x - s)(x - t)$ $y = ax^2 + bx + c$



Apr 18-2:59 PM

- one zero at (0, 0)
- y-intercept at (0, 0)

- max at (60, 30)
- axis of symmetry x = 60

- other zero must be at (120, 0) by symmetry

standard
$y = ax^2 + bx + c$

y-int

$y = ax^2 + bx + 0$

$y = ax^2 + bx$

Sub (60, 30)

$30 = a(60)^2 + b(60)$

$30 = 3600a + 60b$ (1)

Sub (80, 27)

$27 = a(80)^2 + b(80)$

$27 = 6400a + 80b$ (2)

$a = -\frac{1}{120}$

factored
$y = a(x - s)(x - t)$

$y = a(x-0)(x-120)$

$y = ax(x-120)$

Sub (60, 30)

$30 = a(60)(60-120)$

$30 = a(60)(-60)$

$\frac{30}{-3600} = \frac{a(-3600)}{-3600}$

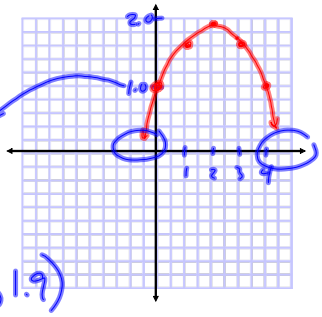
$a = \frac{30}{-3600}$

$a = -\frac{1}{120}$

$y = -\frac{1}{120}x(x-120)$

Apr 18-2:59 PM

2.



$y = ax^2 + bx + c$

$y = ax^2 + bx + 1$

sub (4, 1) (2, 1.9)

$1 = a(4)^2 + b(4) + 1$

$1 = 16a + 4b + 1$

$-1 \quad -1$

$\frac{0}{4} = \frac{16a}{4} + \frac{4b}{4}$

$0 = 4a + b$ ①

$1.9 = a(2)^2 + b(2) + 1$

$1.9 = 4a + 2b + 1$

$-1 \quad -1$

$0.9 = 4a + 2b$ ②

$0 = 4a + b$ ①

sub: $0.9 = b$

$b = 0.9$

sub $b = 0.9$ into ①

$0 = 4a + (0.9)$

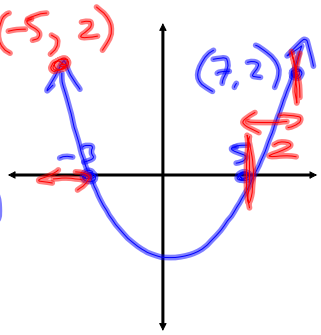
$\frac{-0.9}{4} = \frac{4a}{4}$

$a = -0.225$

$y = -0.225x^2 + 0.9x + 1$

Nov 4-9:23 AM

Ex.1 Find the equation, in factored form, of the quadratic that passes through the points (-3, 0), (5, 0) and (7, 2).



$y = a(x - s)(x - t)$

$y = a(x - (-3))(x - (5))$

$y = a(x + 3)(x - 5)$

sub (7, 2) into equation

$2 = a(7 + 3)(7 - 5)$

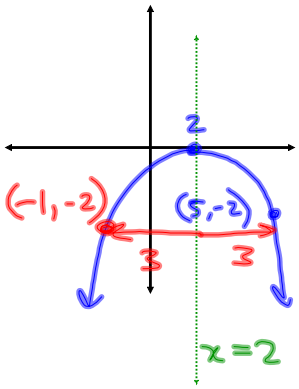
$2 = a(10)(2)$

$\frac{2}{20} = \frac{a(20)}{20}$

$a = \frac{1}{10}$ $\quad y = \frac{1}{10}(x + 3)(x - 5)$

Apr 22-9:25 PM

Ex.2 Find the equation of the parabola, in factored form, that has only one zero, which is 2, and that passes through the point (5, -2).



$y = a(x-s)(x-t)$

$y = a(x-2)(x-2)$

$y = a(x-2)^2$

Sub (5,-2)

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

$-2 = a(3)^2$

$\frac{-2}{9} = \frac{9a}{9}$

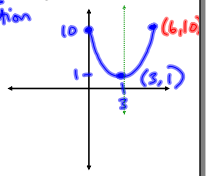
$a = -\frac{2}{9}$

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

Apr 18-3:18 PM

Ex.3 A bird swoops from a branch 10 m above the ground. After 3 seconds it is 1 m above the grass, and then it flies to a perch in another tree. Assuming the path is *approximately parabolic*, model the flight of the bird.

equation



$y = a(x-s)(x-t)$

no zeros, cannot use factored form

$y = ax^2 + bx + c$

y-int = 10

$y = ax^2 + bx + 10$

Sub 2 points to find a and b.

Sub (3,1)

$1 = a(3)^2 + b(3) + 10$

$1 = 9a + 3b + 10$

$\frac{0}{3} = \frac{9a}{3} + \frac{3b}{3} + \frac{9}{3}$

$0 = 3a + b + 3$ ①

Sub (6,10)

$10 = a(6)^2 + b(6) + 10$

$10 = 36a + 6b + 10$

$-10 \quad -10$

$\frac{0}{6} = \frac{36a}{6} + \frac{6b}{6}$

$0 = 6a + b$ ②

$0 = 6a + b$ ②

$0 = -3a + 3$ subtract

$3a = 3$

$a = 1$ → Sub $a=1$ into ②

$0 = 6(1) + b$

$0 = 6 + b$

$b = -6$

$\therefore y = x^2 - 6x + 10$

cannot be factored

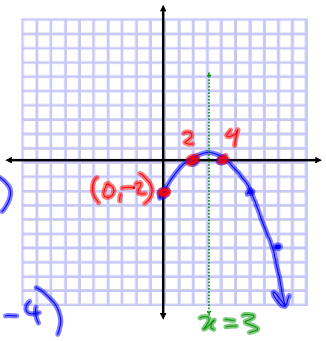
∴ no zeroes

Nov 1-11:02 PM

Assigned Work:

p.175 # 1, 2, 4, 6, 9, 11, 15*

1.



$y = a(x-s)(x-t)$

$y = a(x-2)(x-4)$

sub $(0,-2)$

$-2 = a(0-2)(0-4)$

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

$\frac{-2}{8} = \frac{a(8)}{8}$

$-\frac{1}{4} = a \longrightarrow y = -\frac{1}{4}(x-2)(x-4)$

$y = -\frac{1}{4}(x^2-4x-2x+8)$

$y = -\frac{1}{4}(x^2-6x+8)$

$y = -\frac{1}{4}x^2 + \frac{6}{4}x - \frac{8}{4}$

$y = -\frac{1}{4}x^2 + \frac{3}{2}x - 2$

Nov 3-11:10 AM