Applications of Quadratics

Revenue Probs.

Sell: 50 @ $22
$3 ↑ Sell 4 less

Maximize Revenue

Find Vertex

$R = (\text{price})(\#\text{sold})$

$R = (22+3x)(50-4x)$

$22+3x=0 \quad 50-4x=0$

$3x=-22 \quad 50=4x$

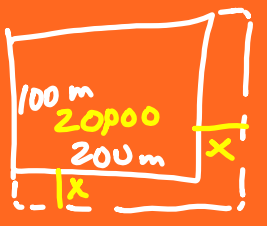
$x=-7.33 \quad 12.5=x$

Vertex

$x = \frac{p+q}{2} = \frac{-7.33+12.5}{2}$

y = sub in x-coord

Border/Area



Double area

$(200+x)(100+x) = 40{,}000$

Foil, set = 0
Solve.

Projectile Motion

Maximum height

Find vertex:

$t = \frac{-b}{2a}$ h = sub in t.

How long to hit ground?

$h = 0$
Solve (by quadr. formula)

Cost $= 20x + 1000$

Revenue $= 300x - 2x^2$

Maximize profit

Vertex.

Profit = Rev − Cost

6) $h = -\frac{500}{9}t^2 + \frac{1000}{3}t + 10$

Vertex

$t = x: -\frac{b}{2a} = \frac{-\frac{1000}{3}}{2\left(-\frac{500}{9}\right)} = \frac{-\frac{1000}{3}}{-\frac{1000}{9}}$

$= \frac{-1000}{3} \cdot \frac{9}{-1000}^{3}$

$= 3$ sec

$h = -\frac{500}{9}(3)^2 + \frac{1000}{3}(3) + 10$

$-500 + 1000 + 10$

$= 510$ ft.

63 10 ft high
Spike downward @ 55 ft/s

$h(t) = \frac{1}{2}at^2 + V_0t + S_0$

$h(t) = \frac{1}{2}(32)t^2 - 55t + 10$

$h(t) = -16t^2 - 55t + 10$

$0 = -16t^2 - 55t + 10$ ← Solve
1) graph
2) compl. sq.
3) quadr formula
4) factoring

$t = \frac{55 \pm \sqrt{55^2 - 4(-16)(10)}}{2(-16)}$

a) $\frac{2x^2}{2} + \frac{26}{2}x - \frac{1}{2} = \frac{0}{2}$

$x^2 + 13x - \frac{1}{2} = 0$

$x^2 + 13x + \frac{169}{4} = \frac{2}{4} + \frac{169}{4}$

$+\frac{13}{2}$

$\sqrt{(x + \frac{13}{2})^2} = \sqrt{\frac{171}{4}}$

$x + 13/2 = \pm\frac{\sqrt{171}}{2}$

$x = -\frac{13}{2} \pm \frac{\sqrt{171}}{2}$

$\frac{-13 \pm \sqrt{171}}{2}$

$\frac{6r^2}{6} + \frac{6r}{6} + \frac{12}{6} = \frac{0}{6}$

$r^2 + r + 2 = 0$

$r^2 + r + \frac{1}{4} = -2 + \frac{1}{4}$

$+1/2$

$(x + 1/2)^2 = -\frac{7}{4}$

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