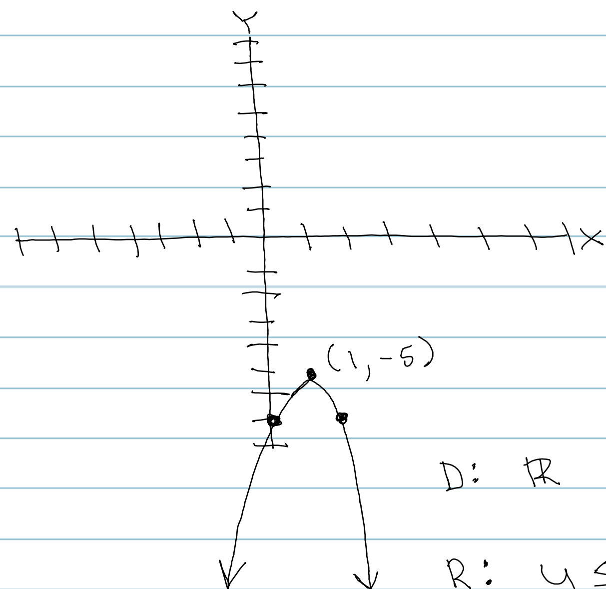
$$\boxed{y = -2x^2 + 4x - 7}$$

shape 

vertex : $(1, -5)$

$a = -2$ $-$ down
2 stretch (narrow)

x	y
0	-7
1	-5
2	-7



D: $\mathbb{R}$

R: $y \le -5$

$(-\infty, -5]$

Word Problems

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It builds 50 houses $\longrightarrow$ sell for \$190,000 each
It builds 70 houses $\longrightarrow$ sell for \$170,000 each

Goal: Linear demand function
Goal: Largest revenue $\rightarrow$ # of houses
actual revenue

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set-up options

(p, q) or $\overset{x}{(q}, \overset{y}{p)}$ Price on top

$m = \dfrac{q_2 - q_1}{p_2 - p_1}$ $m = \dfrac{p_2 - p_1}{q_2 - q_1}$

$(q, p) \rightarrow (50, 190000)$

$(70, 170000)$

$m = \dfrac{190000 - 170000}{50 - 70} = \dfrac{20000}{-20}$

$= -\$1,000$ loss per house

Linear demand function

$y = mx + b$, $y - y_1 = m(x - x_1)$

$p - p_1 = m(q - q_1)$

$(q_1, p_1) = (70, 170000)$

$m = -1,000$

$p - 170\,000 = -1000(q - 70)$

$p - 170\,000 = -1000q + 70\,000$

$\boxed{p = -1000q + 240000}$ Linear Demand Function

Revenue

profit = R − C

R = (price) · (quantity)

$R = p \cdot q \longrightarrow R = (-1000q + 240000)(q)$

$$\boxed{R = -1000q^2 + 240000q}$$

Quadratic

max ⟶ vertex

$q = h = \frac{-b}{2a} = \frac{-240\,000}{2(-1000)} = 120\text{qty}$

$R = k = -1000(120)^2 + 240000(120) =$

\$14,440,000 profit

$P = -1{,}000q + 240000$

$= -1{,}000(120) + 240000$

$p = \$120{,}000$