

Mr. N. Nolfi

Victim:

Mr. Solutions

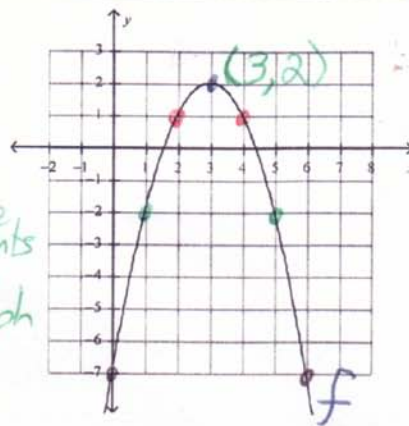
KU	APP	COM
/10	/15	/5

1. Find an equation, in vertex form, of the parabola shown at the right. (5 KU)

$$f(x) = -(x-3)^2 + 2$$

Justification

- Vertex is located at $(3, 2)$
- parabola opens downward
- The base function is $y = x^2$ and there is no vertical stretch or compression



2. Farhan hit a baseball with a bat. The height of the ball is given by the function $h(t) = -4.9t^2 + 30t + 0.8$, where $h(t)$ is the height in metres and t is the time in seconds. As soon as the ball was hit, Raajiv started running in an attempt to catch the ball. If Raajiv caught the ball just as it was about to hit the ground, how long did he have to run before catching the ball? (5 APP)

When the ball hits the ground, the height is zero

$$\therefore h(t) = 0$$

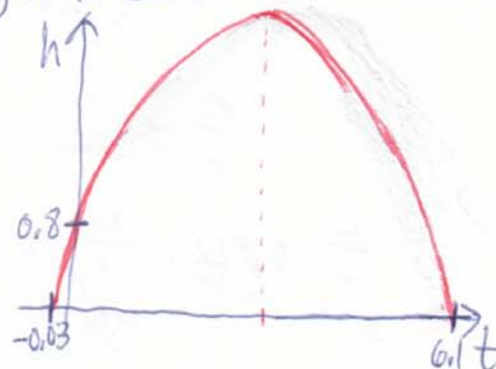
$$\therefore -4.9t^2 + 30t + 0.8 = 0$$

$$\therefore t = \frac{-30 \pm \sqrt{30^2 - 4(-4.9)(0.8)}}{2(-4.9)}$$

$$\therefore t \doteq -0.03s \text{ or } t \doteq 6.1s$$

$$\text{Since } t \geq 0, \quad t \doteq 6.1s$$

Raajiv had to run for about 6.1s before he caught the ball. //



3. Simplify $(4 - \sqrt{7})(5 + \sqrt{60})$. Express your answer in simplest form. (5 KU)

$$= 20 + 4\sqrt{60} - 5\sqrt{7} - \sqrt{7}\sqrt{60}$$

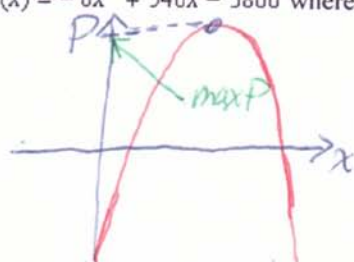
$$= 20 + 4\sqrt{4 \times 15} - 5\sqrt{7} - \sqrt{7}\sqrt{4 \times 15}$$

$$= 20 + 4(2\sqrt{15}) - 5\sqrt{7} - \sqrt{7}(2\sqrt{15})$$

$$= 20 + 8\sqrt{15} - 5\sqrt{7} - 2\sqrt{105}$$

4. The profit $P(x)$ of a book company, in thousands of dollars, is given by the function $P(x) = -6x^2 + 540x - 3800$ where x is the amount spent on printing costs, in thousands of dollars. (10 APP)

- Determine the maximum profit the company can make.
- Determine the amount spent on printing that will result in the maximum profit.
- What amount must be spent on printing to obtain a profit of at least \$7 000 000?



- (a) Since $P(x)$ is a quadratic function, its maximum value occurs at the vertex (graph of $y = P(x)$ opens downward).

$$P(x) = -6x^2 + 540x - 3800$$

$$= -6(x^2 - 90x) - 3800$$

$$= -6(x^2 - 90x + 45^2 - 45^2) - 3800$$

$$= -6(x - 45)^2 + 12150 - 3800$$

$$= -6(x - 45)^2 + 8350$$

∴ the co-ordinates of the vertex are (45, 8350)

∴ the maximum profit is \$8350,000. //

- (b) From (a) we know that the co-ordinates of the vertex are (45, 8350). Therefore, maximum profit is achieved when \$45,000 is spent on printing.

(c) $x = ?$ $P(x) = 7000$

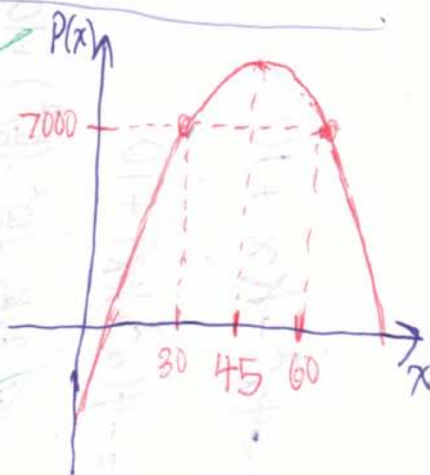
$$∴ -6x^2 + 540x - 3800 = 7000$$

$$∴ -6x^2 + 540x - 10800 = 0$$

$$∴ x^2 - 90x + 1800 = 0$$

$$∴ (x - 30)(x - 60) = 0$$

$$∴ x = 30 \text{ or } x = 60$$



To obtain a profit of \$7000000, the amount spent on printing should be \$30000 or \$60000.