5, 6, 9

5. Revenue = Profit × # Sold

"Amount over Cost Price"

$$= (800+20x)(60-x)$$
$$= 48000 - 800x + 1200x - 20x^2$$
$$= -20x^2 + 400x + 48000$$
$$= -20(x^2 - 20x + 100 - 100) + 48000$$
$$= -20(x-10)^2 + 2000 + 48000$$
$$= -20(x-10)^2 + 50\,000$$

max Revenue (we dont need)

$x = 10$

∴ Amount over Cost Price
$$= 800 + 20x$$
$$= 800 + 20(10)$$
$$= 81000$$

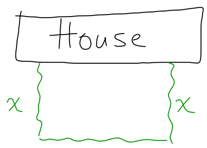
---

6. Profit $= (30 - 1.50x)(60 + 10x)$ — # of people
$$= 1800 + 300x - 90x - 15x^2$$
$$= -15x^2 + 210x + 1800$$
$$= -15(x^2 - 14x + 49 - 49) + 1800$$
$$= -15(x-7)^2 + 735 + 1800$$
$$= -15(x-7)^2 + 2535$$

$x = 7$

# of people $= 60 + 10x$
$$= 60 + 10(7)$$
$$= 130$$

#9



→ y

$$P = 2x + y$$
$$24 = 2x + y$$
$$24 - 2x = y$$

$$A = l \cdot w$$
$$= x(24-2x)$$
$$= 24x - 2x^2$$
$$= -2x^2 + 24x$$
$$= -2(x^2 - 12x + 36 - 36)$$
$$= -2(x-6)^2 + 72$$

$x = 6$ m
$y = 24 - 2x$
$y = 12$ m

∴ 6m by 12m

---

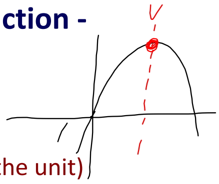
8. most efficient = vertex

$$C(v) = 0.0029v^2 - 0.48v + 142$$
$$= 0.0029\left(v^2 - \frac{4800}{29}v\right) + 142$$
$$= 0.0029\left(v^2 - \frac{4800}{29}v + \frac{5760000}{841} - \frac{5760000}{841}\right)$$

$+\frac{14}{2}$

$$\frac{4800}{29} \times \frac{1}{2}$$
$$\left(\frac{2400}{29}\right)^2$$
$$\frac{5\,760\,000}{841}$$

1.3B Maximum or Minimum of a Quadratic Function - Partial Factoring



Recall that to find the vertex we can:

- Complete the square (time consuming)
- Factor -> Vertex falls halfway between the zeros (later in the unit)

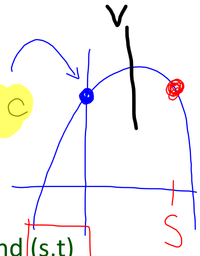
And now for something sort of brand new...

Finding the Vertex by Partial Factoring

$$y = ax(x - s) + t$$

$y = ax^2 + bx + c$

$x = 0,\ y = t$ $\quad x = s,\ y = t$



- determines 2 points that are the same height (0,t) and (s,t)

y-int

- these points can then be used to determine the vertex

$y = ax^2 + bx + c$

Here is the technique:

* Remove "ax" from first 2 terms

Then, if x = 0, y = t

if x = s, y = t

These points are NOT the Zeros!!!

☆ (0,t) and (s,t) are points on the graph at a height of 't'

☆ When you have these 2 points at the same height, you can use *symmetry* to find the vertex.

Consider:

$y = 3x^2 - 24x + 3$

What is the y-intercept?

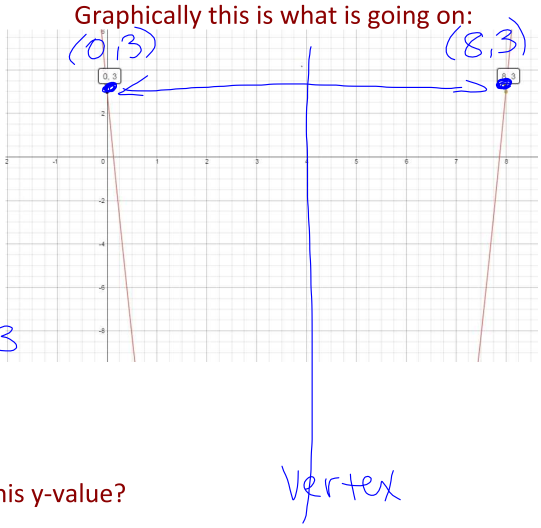
(0 , 3)

Partially Factored:

$y = 3x(x-8) + 3$

$x=0,\ y=3 \quad x=8,\ y=3$

Graphically this is what is going on:



What is the y-intercept?

(0 , 3)

What other value of x gives this y-value?

(8 , 3)

What is the axis of symmetry?

$x = \frac{0+8}{2}$

$x = 4$

What is the vertex?

$y = 3x^2 - 24x + 3$

$y = 3(4)^2 - 24(4) + 3$

$y = -45$

∴ Vertex (4, -45)

Ex. 1 Use partial factoring to determine the vertex.

a) $y = 2x^2 + 10x + 1$

$= 2x(x+5) + 1$

$x = 0$, $y = 1$, $(0, 1)$

$x = -5$, $y = 1$, $(-5, 1)$

Vertex

$x = \frac{0 + (-5)}{2}$

$x = -\frac{5}{2}$

$V\left(-\frac{5}{2}, -\frac{23}{2}\right)$

$y = 2x^2 + 10x + 1$

$= 2\left(-\frac{5}{2}\right)^2 + 10\left(-\frac{5}{2}\right) + 1$

$= 2\left(\frac{25}{4}\right) - 25 + 1$

$-24 \rightarrow -\frac{48}{2}$

$= \frac{25}{2} - \frac{48}{2}$

$y = -\frac{23}{2}$

b) $y = -2x^2 + 8x - 13$

$V(2, -5)$

c) $y = -x^2 + 5x - 3$ $V\left(\frac{5}{2}, \frac{13}{4}\right)$

d) $y = 5x^2 - 2x + 1$ $\left(\frac{1}{5}, \frac{4}{5}\right)$

Homework
p. 31 #3
Handout

Word Pr: 1a, 3b, 4, 5, 6, 8

#1, 2 enough to be partial factoring experts ☺