Assignment #12

p. 520 #6

Let us assume that not just tuition, but also room and board are increasing at about 4% per year.

Let $C(t)$ = the cost of tuition, room, and board at a private college t years from now.

$$C(t) \approx 25000(1.04)^t$$

To find when the anticipated costs will reach \$100,000 we solve for t below.

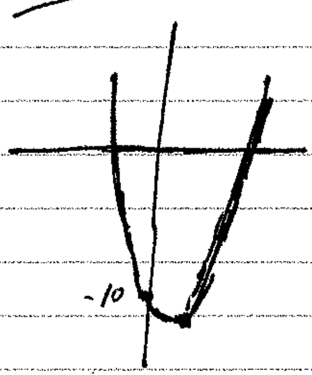
$$100{,}000 = 25{,}000(1.04)^t$$
$$4 = (1.04)^t$$
$$t \approx 35.35$$

So, the anticipated costs will reach \$100,000 per year in a little over 35 years.

p. 544 #10

$y = 2x^2 - 5x - 10$

Sketch



If $x = 0$, $y = -10$
So, the y-intercept is at $(0, -10)$

The vertex is where
$x = -b/2a = 5/4 = 1.25$

If $x = 1.25$, $y = -13.125$
So, the vertex is at $(1.25, -13.125)$

Assignment #12

p.544 #14

It looks like the vertex is at about (30,15)
and the y-intercept is at about (0,60)

The equation has the form $y = a(x-30)^2 + 15$

But when $x = 0$, $y = 60$ so we solve for a below

$$60 = a(0-30)^2 + 15$$
$$45 = 900a$$
$$a = 0.05$$

So, our equation is

$$\boxed{\begin{array}{l} y = 0.05(x-30)^2 + 15 \\ \text{or} \quad y = 0.05x^2 - 3x + 60 \end{array}}$$

p544 #22

$\Pi(Q)$ = profit when quantity Q is sold.

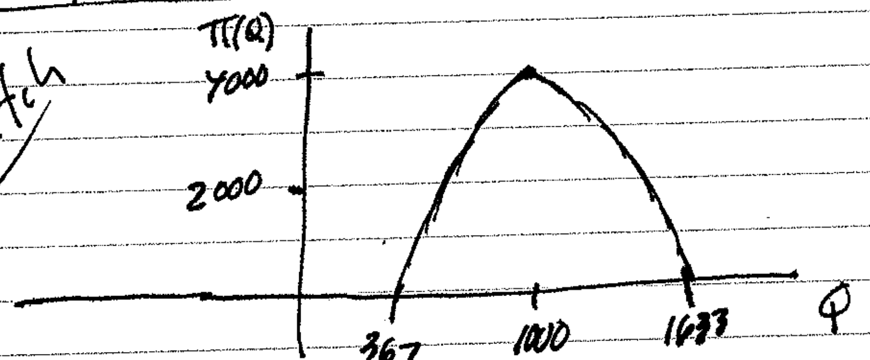
$$\Pi(Q) = -0.01Q^2 + 20Q - 6000$$

a) Profit is maximum when $Q = \dfrac{-20}{2(-0.01)} = 1000$

So, profit is maximum when 1000 units are produced.
That profit is $\Pi(1000)$ or 4000

b)

sketch



P. 544 #24

$C(w)$ = Average Cost of production per widget when w are produced

$C(w) = a(w-200)^2 + 250$ for some a

We know from the given information that

$250.05 = a(201-200)^2 + 250$

So, $a = 0.05$

Hence, our function is

$$\boxed{\begin{aligned} C(w) &= 0.05(w-200)^2 + 250 \\ \text{OR} \quad C(w) &= 0.05w^2 - 20w + 2250 \end{aligned}}$$