3.2 Q8 $C(t) = \dfrac{0.1t}{(t+3)^2}$, $1 \le t \le 6$

$$C'(t) = \frac{0.1(t+3)^2 - 0.1t\left[2(t+3)'(1)\right]}{(t+3)^4}$$

$$= \frac{0.1(t+3)^1 - 0.1t\left[2(1)\right]}{(t+3)^3}$$

$$= \frac{0.1\left[(t+3) - 2t\right]}{(t+3)^3}$$

$$= \frac{0.1\left[3-t\right]}{(t+3)^2}$$

$\therefore C'(t) = 0$ when $t = 3$

Check

$C(1) = 0.0063$

$C(3) = 0.0083$

$C(6) = 0.0074$

$\therefore$ AMax $= 0.0083$

AMin $= 0.0063$

Q10 $r(x) = \frac{1}{4}\left[\frac{4900}{x} + x\right] = \frac{1}{4}\left[4900x^{-1} + x\right]$

$r'(t) = \frac{1}{4}\left[-4900x^{-2} + 1\right] = 0$

$\therefore \dfrac{4900}{x^2} = 1$

$x^2 = 4900$

$x = 70$ km/h

$r(30) = 48.\dot{3}$

$r(70) = 35 \leftarrow$ BEST!

$r(120) = 40.2$

So @ 70km/h, require 35L/100 km

Thus 70 L required for 200 km

Whence Cost $= 70(1.15)$

$= \underline{\$80.50}$

Q14) $u(x) = \dfrac{c(x)}{x} = 3000x^{-1} + 9 + 0.05x$

$u'(x) = -3000x^{-2} + 0.05 = 0$

$\therefore \quad \dfrac{3000}{x^2} = \dfrac{1}{20}$

$x^2 = 60000$

$x \doteq 245$

$u(1) = \$3009.05$

$u(245) = \$33.49$

$u(300) = \$34$

Thus 245 units of production will minimize unit cost.

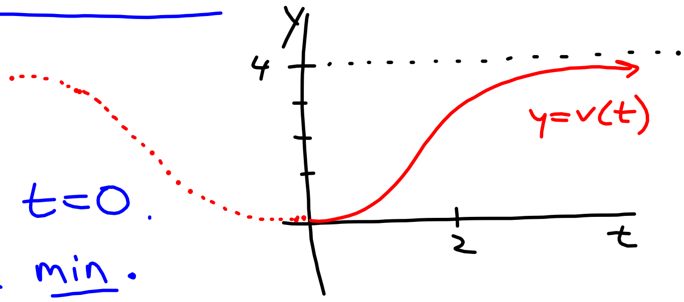
Q5b) $v(t) = \dfrac{4t^2}{1+t^2}, \quad t \geq 0$

$v'(t) = \dfrac{8t(1+t^2) - 4t^2(2t)}{(1+t^2)^2}$

$= \dfrac{8t}{(1+t^2)^2}$

So $v'(t) = 0$ when $t = 0$.

$\therefore \quad v(0) = 0$ is the min.



$\lim\limits_{t\to\infty} v(t) = \lim\limits_{t\to\infty} \dfrac{4t^2}{1+t^2}$

$= \lim\limits_{t\to\infty} \dfrac{4}{\frac{1}{t^2}+1}$

$= \dfrac{4}{0+1}$

$= 4$

So, NO max but as $t \to \infty$, $v(t) \to 4$.