Q18

Speed (km/h) | Mileage (km/L)

x	m(x)
110	8
111	7.9

$1 - 0.1$

$m = -0.1$

$\frac{x-110}{1} = \frac{m(x)-8}{-0.1}$

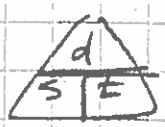
$-0.1x + 11 = m(x) - 8$

$\therefore m(x) = 19 - 0.1x$

Gas Cost = \$1.15 / L

Pay = \$35 / h

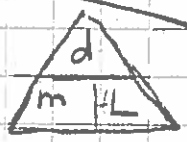
Fixed Cost = \$15.50 / h



Distance = 450 Km

$\therefore t = \frac{450}{\text{speed}}$

$= \frac{450}{x}$



# of Litres $= \frac{d}{m(x)}$

So, Operating Expenses = 1.15 (# of litres) + 35t + 15.50t

$= 1.15\left(\frac{\text{distance}}{\text{mileage}}\right) + 50.5t$

$\therefore E(x) = 1.15\left(\frac{450}{19-0.1x}\right) + 50.5\left(\frac{450}{x}\right)$

$= 517.5(19-0.1x)^{-1} + 22725x^{-1}$

Thus, $\frac{-517.5(-0.1)}{(19-0.1x)^2} - \frac{22725}{x^2} = 0$

$\frac{51.75}{(19-0.1x)^2} = \frac{22725}{x^2}$

$\frac{x^2}{(19-0.1x)^2} = \frac{10100}{23}$

$\frac{x}{19-0.1x} \doteq \pm 20.955$

$x = \pm 398.153 \mp 2.0955x$

$\rightarrow 3.0955x = 398.153$

$x \doteq 128.6$ Km/h

$-1.0955x = -398.153$

$x = 363.4$ Km/h

silly!!

Ergo, the speed required to min. cost is ~129 Km/h.