1) want cost function. 12pts

$C(x) = (\text{Cost for truck}) + (\text{Cost for driver})$

Info: $\left(12 + \frac{x}{6} \frac{\text{cents}}{\text{mile}}\right)\left(\frac{1 \text{ dollar}}{100 \text{ cents}}\right) = \left(0.12 + \frac{x}{600}\right) \frac{\text{dollars}}{\text{mile}}$

$x \frac{\text{miles}}{\text{hour}}$ $\frac{\$6}{\text{hour}}$

400 miles $35 \le x \le 60$

+1 domain.

Truck: $(400 \text{ miles})\left(0.12 + \frac{x}{600}\right) \frac{\text{dollars}}{\text{mile}}$

$= 48 + \frac{2}{3}x$ dollars

Driver: $\left(6 \frac{\text{dollars}}{\text{hour}}\right)\left(\frac{\text{hour}}{x \text{ miles}}\right)(400 \text{ miles})$

$= 2400x^{-1}$ dollars

$C(x) = 48 + \frac{2}{3}x + 2400x^{-1}$ ← +4 for C(x)

+2 for truck
+2 driver
Breakdown.

$C'(x) = \frac{2}{3} - 2400x^{-2}$ +1 C'

$0 = \frac{2x^2 - (2400)3}{3x^2}$

$x^2 = (1200)3$

$x = 60$ +1 (positive ⇒ mph)

min.

Justify: $C(35) = 139.90$ $C(60) = 128$ +3 justify

60 mph +1 Answer

2) $R(x) = (300+x)(90-.25x)$ +2 $0 \le x \le 100$ +1

$R'(x) = 1(90-0.25x) - 0.25(300+x)$

$= 90 - .25x - 75 - .25x$ +1

$0 = 25 - .5x$

$x = 50$ +1

+2 total

$R(0) = \$27{,}000$ +1

$R(50) = \$27{,}125$ +1 ← max profit

$R(100) = \$26{,}000$ +1

+3 total

Largest revenue is $\$27{,}125$ +2

Smallest revenue is $\$26{,}000$ +2

12 Pts

3) follow units: S.D

12 pts

$0 \le D \le 100$ +1 pt

$f(D) = D\left(42 - \frac{D}{3}\right)$ +3

$f(D) = 42D - \frac{D^2}{3}$

$f'(D) = 42 - \frac{2}{3}D$ +2 deriv

$0 = 42 - \frac{2}{3}D$

$D = \frac{42 \cdot 3}{2} = 21 \cdot 3 = 63$ +2 crit pt

$f(0) = 0$ +1

$f(63) = 1323$ +1 ← max } +3 justify

$f(100) = 866.67$ +1

Density = 63 veh./mile +1 Answer

12 pts

4) $M(x) = (2000 - 50x)(20 + x)$ +2

$M'(x) = -50(20+x) + (2000 - 50x)$ +1

$= -1000 - 50x + 2000 - 50x$

$0 = 1000 - 100x$

$x = 10$ +2

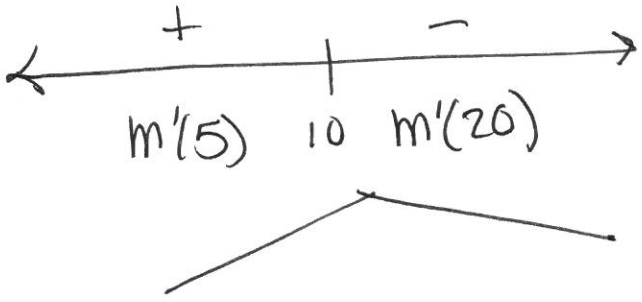
$-20 \leq x \leq 40$
(these values will mean $M(x) = 0$)

$M(10) = 45{,}000$
$M(-20) = 0$
$M(40) = 0$
} "Strange" justification

+3 justification

— or —

1 crit #, if local max ⇒ ab-max



+1 some logical domain.

Max at 10.

Steer/acre is $20 + 10 = \boxed{30}$ ~~+2~~ +3