

1.  $\frac{P}{Q} \cdot \frac{dQ}{dP} = \left(\frac{P}{Q}\right) \left(\frac{P(-1) - (1-P)}{P^2}\right) = \frac{P}{1-P} \cdot \frac{-1}{P^2} = \frac{P^2}{1-P} \cdot \frac{-1}{P^2} = \frac{-1}{1-P}$  (a)

(b)  $|E(3)| = \left| \frac{-1}{1-3} \right| = \frac{1}{2}$  inelastic (c)  $\frac{-1}{1-P} = -1$  if  $P = 0$ .

2.  $f' = 2 - \frac{8}{x^2} = 0$  if  $2x^2 = 8$   $x = \pm 2$

$f'' = \frac{16}{x^3}$

Graph of  $f(x) = 2x - \frac{8}{x}$  with vertical asymptote at  $x=0$ .  
 - For  $x < 0$ ,  $f(x) < 0$ . Local max at  $(-2, -6)$ .  
 - For  $x > 0$ ,  $f(x) > 0$ . Local min at  $(2, 10)$ .  
 - As  $x \rightarrow 0^-$ ,  $f(x) \rightarrow -\infty$ . As  $x \rightarrow 0^+$ ,  $f(x) \rightarrow +\infty$ .  
 - As  $x \rightarrow +\infty$ ,  $f(x) \rightarrow \infty$ . As  $x \rightarrow -\infty$ ,  $f(x) \rightarrow -\infty$ .

3. a)  $2x + y' = 3x^2 + 2yy'$   $\Rightarrow 2x - 3x^2 = (2y-1)y'$   $\Rightarrow y' = \frac{2x-3x^2}{2y-1}$

b)  $\frac{dy}{du} = 2u+1$ ,  $\frac{du}{dx} = -\frac{1}{x^2}$  so  $\frac{dy}{dx} = \left(2\left(\frac{1}{x}\right)+1\right)\left(-\frac{1}{x^2}\right)$

4. a)  $10\left(1+\frac{1}{3}\right)^{3 \cdot 2}$     b)  $10e^{1 \cdot 2} = 10e^2$

5. (a)  $\ln\left(\frac{\sqrt{b}}{c}\right)^{a \cdot \frac{1}{a}} = \ln\left(\frac{\sqrt{b}}{c}\right) = \ln(\sqrt{b}) - \ln c = \frac{1}{2} \ln b - \ln c = \frac{1}{2} \cdot 6 + 2 = 5$

(b)  $3^x 2^{2x} = 3^x \cdot 4^x = \frac{3 \cdot \dots \cdot 3}{x} \cdot \frac{4 \cdot \dots \cdot 4}{x} = \frac{(34)(34)}{x} = \frac{(34)}{x} = 12^x = 144 = 12^2 \Rightarrow x = 2$

6. a)  $C'(x) = \frac{2}{5}x + 4 = \text{marg cost.}$

$R(x) = X P(x) = \frac{x}{4}(36-x)$

$R'(x) = \frac{x}{4}(-1) + (36-x)\frac{1}{4} = 9 - \frac{x}{2}$

b)  $C'(3) = \frac{2}{5}(3) + 4$

c)  $C(4) - C(3) =$

$\left(\frac{1}{5} \cdot 16 + 16 + 57\right) - \left(\frac{1}{5} \cdot 9 + 12 + 57\right)$

$= \frac{1}{5}(16-9) + 4 = \boxed{\frac{7}{5} + 4}$