SECTION 3.1

10. $f'(x) = -4x^{-5}$

26. $y' = 15t^4 - \frac{5}{2}t^{-\frac{1}{2}} - \frac{7}{t^2}$

28. $y' = 6t - \frac{6}{t^{3/2}} + \frac{2}{t^3}$ ← that is a three

60. $C'(q) = 4q$ so marginal cost is \$100.

3.2

6. $\frac{dy}{dx} = \ln(2)\,2^x - 6x^{-4}$

18 $P'(t) = 3000\ln(1.02)\,(1.02)^t$

3.3

8. $y' = \frac{3s^2}{2\sqrt{s^3+1}}$ or $\frac{1}{2}(s^3+1)^{-\frac{1}{2}} \cdot 3s^2$.

24 $y' = \frac{1}{2}(e^x+1)^{-\frac{1}{2}} \cdot e^x$

36 $MR = \frac{1}{1+1000q^2} \cdot 2q \cdot 1000 = \frac{2000q}{1+1000q^2}$

$MR(10) = \$0.2/\text{unit}.$

50 See last page

Sec 3.4

36 $f'(t) = 100e^{-0.5t} + 100t\left(-0.5e^{-0.5t}\right)$ via product rule

$f'(1) = 30\frac{1}{3}$ mg/hr

$f'(5) = -12.31$ mg/hr

38 (a) $q(10) = 2247$ units

(b) $q' = 5000(-0.08)e^{-0.08p}$

$q'(10) \cong -180$. This means that at the price of \$10, \$1 increase results in a decrease in quantity demanded by 180.

~~(b)~~

40 (a) $R(p) = p \cdot 1000e^{-0.02p}$

↓ quantity

↑ price

(b) $R'(p) = 1000e^{-0.02p} + 1000pe^{-0.02p}(-0.02)$

$R(10) \cong 8187$

$R'(q) \cong 655$ $\Rightarrow$ 1 additional dollar increase in price results in a \$655 increase in revenue.

$q=10$

(42) (a) $f(140) = 15{,}000$ means, 15,000 boards are sold at a cost of \$140 per board

(b) $f'(140) = -100$ means, if the price increases by \$1, (from \$140) the demand falls by 100.

(b) $\frac{dR}{dp}$

$$R = p \cdot q \text{, but } q = f(p) \text{, so}$$

$$R = p \cdot f(p) \text{ so using product Rule}$$

$$\frac{dR}{dp} = p f'(p) + f(p) \cdot 1$$

$$= p f'(p) + f(p)$$

$\frac{dR}{dp}$ at $q = 140$, plug in

$$\frac{dR}{dp} = 140 \cdot (-100) + 15{,}000$$

$$= 1000$$

(c) $\frac{dR}{dp} > 0$ so revenue increases by \$1000 if the price increases by \$1.00

3.3 #4.

Economists suggest that an extra year of education increases wages by 14%. Assuming you make \$10 per hr with current education and that inflation increases wages at a continuous rate of 3.5% per year.

Skip

Ignore

(a) How much do you make per hour with 4 additional years.

$$10(1.14)^t \Big|_{t=4} = 16.89 \text{ dollars per year.}$$

(b) In 20 years (difference in wages)

(i) Wages without education are $10.00 e^{0.035(t)} \Big|_{t=20} = 20.14$ dollar/hr

(ii) Wages with additional education $16.89\, e^{0.035(t)} \Big|_{t=20} = 34.01$ dollar/hr

~~(2)~~ (c) Difference $= 16.89 e^{0.035t} - 10.0 e^{0.035t}$

$$= \underline{6.89 e^{0.035t}}$$

Rate of change of difference

$$\frac{d}{dt}\left(6.89 e^{0.035t}\right) = 6.89(0.035)\, e^{0.035t} = 0.2412\, e^{0.035t} \text{ per hr}$$

@ $\underline{t=20}$

difference is increasing at a rate of $0.2412\, e^{0.035(20)}$ = \$0.486/hr/yr