Problems for practice:

Find the derivative: 1. $y=(x^2+3x)^4\ln(5x+2)$ 2. $y=e^{5x+2}\ln(2x-3)$	3. When $p=12$ then $q=600$, when $p=20$ then $q=400$. a. Find a function relating p and q. b. Find the corresponding revenue function
4. Given the demand function: $q=1200-40p$, and a per-item cost of \$5, with an overhead cost of \$200 a. find a revenue function b. find a profit function c. figure out how to get the maximum profit. When the profit is maximum: i. What is the production quantity? ii. What is the price? iii. What is the profit?	5. Yearly revenue from 2002 (t=0) to 2008 (t=6) is approximated by : $R=-.16t^3+1.4t^2+2.1t+2.4$ (millions of dollars) When is the increase in revenue speeding up? When is it slowing down? When is the revenue increasing most rapidly?
6. Given a cost function of $C(x)=15,000+16x+.03x^2$ (for x items) Find the minimum average cost—tell both the production level (x) and the minimum average cost.	7. Integrate: a. $\int 3x^5+1.5x^2-8x+3\,dx$ b. $\int \frac{x}{3}+\frac{2}{x}+\frac{4}{x^2}\,dx$ c. $\int xe^{x^2+3}\,dx$ d. $\int \frac{5}{3x+2}\,dx$ e. $\int (2x+3)\sqrt{x^2+3x+5}\,dx$
8. The marginal cost of producing the xth box of widgets is $12+\frac{3}{x^2}$. The cost to produce 1 widget is \$500. Find the cost function $C(x)$. Find the total cost to produce 100 widgets.	

Answers:

1. $y' = 4(x^2+3x)^3(2x+3)\ln(5x+2) + \dfrac{5(x^2+3x)^4}{5x+2}$

2. $y = 5e^{5x+2}\ln(2x-3) + \dfrac{2e^{5x+2}}{2x-3}$

3. There are two sets of correct answers:

a. $q = -25p + 900$ b. $R = -25p^2 + 900p$	a. $p = -.04q + 36$ b. $R = -.04q^2 + 36q$

4. There are two sets of correct answers to a and b:

a. $R = 1200p - 40p^2$ b. $P = 1400p - 40p^2 - 6200$	a. $R = 30q - .025q^2$ b. $P = 25q - .025q^2 - 200$

The correct answer to c can be found from either choice of b. The complete answer to c is:

$P' = 1400 - 80p = 0$ $\qquad$ $P' = 25 - .050q = 0$

$p = 17.5$ $\qquad$ $q = 500$

c. figure out how to get the maximum profit. When the profit is maximum:
  i. 500
  ii. $17.50
  iii. $6050

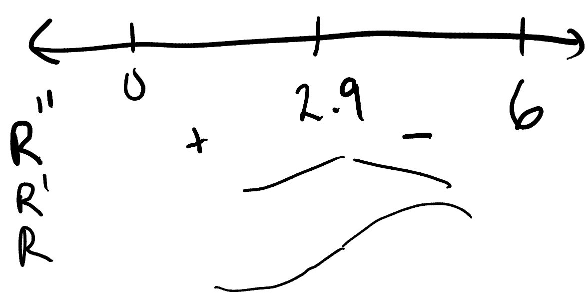
5.

$R = -.16t^3 + 1.4t^2 + 2.1t + 2.4$

$R' = -.48t^2 + 2.8t + 2.1$

$R'' = -.96t + 2.8 = 0$

$t \approx 2.9$



rate of increase is speeding up from 0 to 2.9
which is beginning of 2002 to end of 2004
rate of increase is slowing down from 2.9 to 6
which is end of 2004 to beginning of 2008
revenue is increasing most rapidly at 2.9—end of 2004.

6. $\bar{C}(x) = \dfrac{15{,}000 + 16x + .03x^2}{x} = 15{,}000x^{-1} + 16 + .03x$

$\bar{C}'(x) = -15{,}000x^{-2} + .03 = 0$ $\dfrac{-15000}{x^2} = -.03$ $15000 = .03x^2$ $500{,}000 = x^2$ $x = 707$	Minimum average cost occurs when making 707 items, and the minimum average cost is $58.43

7. a. $\int 3x^5 + 1.5x^2 - 8x + 3\,dx = \frac{x^6}{2} + .5x^3 - 4x^2 + 3x + C$

b. $\int \frac{x}{3} + \frac{2}{x} + \frac{4}{x^2}\,dx = \frac{x^2}{6} + 2\ln|x| - 4x^{-1} + C$

c. $\int xe^{x^2+3}\,dx = \frac{1}{2}e^{x^2+3} + C$

d. $\int \frac{5}{3x+2}\,dx = \frac{5}{3}\ln|3x+2| + C$

e. $\int (2x+3)\sqrt{x^2+3x+5}\,dx = \frac{2}{3}(x^2+3x+5)^{3/2} + C$

8. $C'(x) = 12 + \frac{3}{x^2}$

$C(x) = 12x - \frac{3}{x} + C$

$C(1) = 12 - 3 + C = 500$

$C = 491$

$C(x) = 12x - \frac{3}{x} + 491$

The total cost to produce 100 widgets is $1690.97