Problems for practice:

Find the derivative of each: 1. $y=(5x+2)^4\ln(x)$ 2. $y=(x^2+3)^4\ln(5x-1)$ 3. $y=(x^2+3x)^4e^{2x+1}$ 4. $y=\ln(2x+5)e^{3x}$	5. When $p=10$ then $q=200$, when $p=8$ then $q=150$. Find a linear equation (demand function) relating p and q. 6. When $t=50$ then $y=120$, when $t=60$ then $y=100$. Find a linear equation relating t and y.
7. Given the demand function: $q=60,000-240p$ a. find the associated revenue function b. Given a per-item cost of \$70, find the profit function. c. Use b to maximize the profit: i. What production quantity maximizes the profit? ii. What price point maximizes the profit? iii. What is the maximum profit?	8. a. Given the demand function: $q=120,000-2000p$ a. find the associated revenue function b. Given a per-item cost of \$10 and a fixed cost of \$25000, find the profit function. c. Use b to maximize the profit: i. What production quantity maximizes the profit? ii. What price point maximizes the profit? iii. What is the maximum profit?
Review with second derivatives: 5.3 # 65, 69, 73 9. The annual revenue of a product is related to the amount of money *x* spent on advertising by the following function: $R=-.003x^3+1.35x^2+2x+8000$ ($0\le x\le 400$) (R and x in thousands of dollars). a. Where is R concave up (change in revenue increasing/speeding up)? Where is R concave down (change in revenue decreasing/slowing down)? b. Is it more beneficial to increase the advertising budget slightly when x = 140,000 or when x = 160,000 10. Yearly revenue from 2004 (t=0) to 2008 (t=4) is approximated by : $R=-.2t^3+1.64t^2+1.3t+3.2$ (millions of dollars) When is the increase in revenue speeding up? When is it slowing down? When is the revenue increasing most rapidly?	Review with average cost: 11. Given a cost function of $C(x)=12,000+210x+.01x^2$ (for *x* items) Find the minimum average cost—tell both the production level (*x*) and the minimum average cost.

Answers:

Find the derivative of each: 1. $y = 20(5x+2)^3 \ln(x) + \frac{(5x+2)^4}{x}$ 2. $y = 8x(x^2+3)^3 \ln(5x-1) + \frac{5(x^2+3)^4}{5x+1}$ 3. $y = 4(2x+3)(x^2+3x)^3 e^{2x+1} + 2(x^2+3x)^4 e^{2x+1}$ 4. $y = \frac{2e^{3x}}{2x+5} + 3\ln(2x+5)e^{3x}$	5. $p = -25x + 450$ 6. $y = -2t + 220$
7. Either set of answers is considered correct. a. $R(p) = 60,000p - 240p^2$ or $R(q) = 250q - .00417q^2$ b. $P(p) = 76800p - 240p^2 - 4,200,000$ or $P(q) = 180q - .00417q^2$ c. Use b to maximize the profit: i. $q \approx 21600$ (21600 or 21582 are both acceptable answers) ii. $160 iii. ~$1,944,000	8. a. Given the demand function: $q = 120,000 - 2000p$ a. $R(p) = 120,000 - 2000p^2$ or $R(q) = 60q - .0005q^2$ b. $P(p) = 140,000p - 2000p^2 - 1,225,000$ or $P(q) = 50q - .0005q^2 - 25000$ c. Use b to maximize the profit: i. 50,000 ii. $35 iii. $1,225,000
Review with second derivatives: 5.3 # 65, 69, 73 (see back of book for answer) 9. a. Concave up $0 \le x < 150$; concave down $150 < x \le 400$ b. More beneficial (rate increases more) when x = 140,000 10. Yearly revenue from 2004 (t=0) to 2008 (t=4) is approximated by : $R = -.2t^3 + 1.64t^2 + 1.3t + 3.2$ (millions of dollars) Increase in revenue is speeding up between t=0 and t=2.7 (from 2004 to middle of 2006) Increase in revenue is slowing down from t=2.8 to t=4 (from late 2006 to 2008). Revenue is increasing most rapidly (R' has a maximum) when t=2.73 (about October 2006).	Review with average cost: 11. $x \approx 1095$ items $\overline{C} \approx 231.91$