

MATH 103 200710 Problem Set 6

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The following problems may appear on the quiz on Tuesday, March 20, 2007.

1. Differentiate the following functions using the product rule and, if necessary, the generalized power rule.

(a) $y = (x^2 + 3)(2x - 1)$ (b) $y = x^2(7x - 1)^2$ (c) $[(x - 1)(7x + 2)]^4$ (d) $x^7(3x^4 + 12x - 1)^2$

2. Differentiate the following functions using the quotient rule.

(a) $y = \frac{x^2 + 2x - 1}{x^2 + 2x - 2}$ (b) $y = \frac{1}{x+1} + \frac{1}{x-1}$ (c) $y = \frac{x^2}{(x^2 + 1)^2}$ (d) $y = \frac{x + 2}{(x + 3)(x + 4)}$

3. Differentiate the following functions using the chain rule and any other rules as necessary.

(a) $y = (x^4 + x^2)^{10}$ (b) $y = \sqrt{x^2 + 1}$ (c) $y = 1/(1 - x^2)$ (d) $y = x^3(x^3 - 2)^4$

4. Find the equation of the tangent line to the graph of $y = (x + 1)/(x - 1)$ at the point (2, 3).

5. Find the equation of the tangent line to the graph of $y = x/\sqrt{2 - x^2}$ at the point (1, 1).

6. Find the inflection points on the graph of $y = \frac{1}{x^2 + 1}$.

7. Find the stationary points on the graph of $y = \sqrt{x^2 - 6x + 10}$.

8. Sketch the graph of $y = 4x/(x + 1)^2$, $x > -1$ showing minima, maxima, inflection points, and asymptotes.

9. When a company produces and sells x thousand units per week its total weekly profit is P thousand dollars, where $P = 200x/(100 + x^2)$. The production level at t weeks from the present is $x = 4 + 2t$.

(a) Find the marginal profit, dP/dx .

(b) Find the time rate of change of profit, dP/dt .

(c) How fast (with respect to time) are profits changing when $t = 8$?

10. A cigar manufacturer produces x cases of cigars per day at a total daily cost of $50x(x + 200)/(x + 100)$ dollars. Show that, as the output x increases, the total cost increases but the average cost per case decreases.

Please do the following problems from the textbook. They may appear on Midterm Test 2.

3.1 C-level: 1–28, 37–40; B-level: 29–32, 41–49, 52–58; A-level: 33–36, 59–66

3.2 C-level: 1–20, 29–44; B-level: 21–28, 45–48; A-level: 53–54, 56–64