

CHAPTER 3 REVIEW

FRI, OCT 18, 2013

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Problem 1 (Section 3.1 Exercise #51). Find the points on the curve $y = 2x^3 + 3x^2 - 12x + 1$ where the tangent line is horizontal.

Problem 2 (Section 3.1 Exercise #53). Show that the curve $y = 2e^x + 3x + 5x^3$ has no tangent line with slope 2.

Problem 3 (Section 3.1 Exercise #67). Let

$$f(x) = \begin{cases} x^2 + 1 & \text{if } x < 1 \\ x + 1 & \text{if } x \geq 1 \end{cases}.$$

Is f differentiable at $x = 1$? Sketch the graphs of f and f' .

Problem 4 (Section 3.2 Exercise #33). Find equations of the tangent line and normal line to the curve $y = 2xe^x$ at the point $(0, 0)$.

Problem 5 (Section 3.2 Exercise #55). Find $R'(0)$, where

$$R(x) = \frac{x - 3x^3 + 5x^5}{1 + 3x^3 + 6x^6 + 9x^9}.$$

Problem 6 (Section 3.4 Exercise #72). If g is a twice-differentiable function and $f(x) = xg(x^2)$, find f'' in terms of g, g', g'' .

Problem 7 (Section 3.5 Exercise #21). If $f(x) + x^2(f(x))^3 = 10$ and $f(1) = 2$, find $f'(1)$.

Problem 8 (Section 3.6 Exercise #51). Find y' if $y = \ln(x^2 + y^2)$.

Problem 9 (Section 3.6 Exercise #54). Find $\frac{d^9}{dx^9}(x^8 \ln x)$.

Problem 10 (Section 3.8 Exercise #10). A sample of tritium-3 decayed to 94.5% of its original amount after a year. What is the half-life of tritium-3? How long would it take the sample to decay to 20% of its original amount?

Problem 11 (Section 3.9 Exercise #7(a)). Suppose $y = \sqrt{2x+1}$, where x and y are functions of t . If $\frac{dx}{dt} = 3$, find $\frac{dy}{dt}$ when $x = 4$.

Problem 12 (Section 3.9 Exercise #31). The top of a ladder slides down a vertical wall at a rate of 0.15 m/s. At the moment when the bottom of the ladder is 3 m from the wall, it slides away from the wall at a rate of 0.2 m/s. How long is the ladder?