

This Review Sheet is only for new material: Sections 9.4-9.8, 10.1-10.2, 11.1-11.2, 13.2.
The Final Exam will be over material from the entire semester.
Use the old review sheets, exams, and quizzes to study material prior to Section 9.4.

1. Differentiate the following functions.

(a). $f(x) = 6x^3 - 3x^2 + \frac{1}{x}$

(b). $z = 2u^{4/3} - 3u^{3/5}$

(c). $y = \sqrt{x^2 - 4x}$

(d). $g(t) = t \ln(4t)$

(e). $y = \sqrt{x}e^{-3x}$

(f). $g(x) = \frac{x^2 - 3x + 1}{x + 4}$

2. Find the equation of the tangent line to $y = 4x^2 + 2x + 5$ at $x = -1$.

3. Find the first and second derivatives of $y = (x^2 + 4)^8$

4. The supply of q units of a product at a price p dollars is given by $p = 25 + 145 \ln(2q + 3)$

(a). Find the rate of change of supply price with respect to the number of units supplied.

(b). Find the rate of change of supply price when the number of units supplied is 100. Interpret your result.

5. Given $y = \ln\left(\frac{x^2}{2x+1}\right)$, use properties of logarithms to expand the function first and then find the derivative y' .

6. Find the equation of the tangent line to $y = e^{x^2-4}$ at $x = 2$.

7. [A problem like this may be on a non-calculator portion of the exam, so do it **without** a calculator.] Given $y = x^4 - 4x^3$, use the function and its derivatives to find the (a) critical values, (b) intervals where the function is increasing and where it is decreasing, and (c) critical **points**, each classified as a relative maximum, minimum, or horizontal point of inflection. Find the (d) intervals where the function is concave up and where it is concave down and (e) any inflection **points**. Plot the points found in parts (c) and (e). Then use all of the information in parts (a)-(e) to sketch the function. You must show all your work for credit.

8. Section 10.2, #27

9. A company daily sales due to an advertising campaign is given by $S = 10 + 75t + 36t^2 - t^3$ where t is the number of days after the sales campaign begins.

(a). Find how long it will take before the sales are maximized. What is the maximum sales?

(b). Find how long before the rate of change of sales is minimized. That is, find the point of diminishing returns.

10. Evaluate the following integrals:

(a). $\int 7x^3 - 4x + 2 \, dx$

(b). $\int \sqrt{x} - \frac{2}{x^3} \, dx$

(c). $\int_1^2 x + 4x^3 \, dx$

(f). $\int_0^1 (x - 5)^2 \, dx$

11. A company finds that its marginal revenue from selling x units is given by $MR = 212 - 0.3x$. Use a definite integral to find the additional revenue gained when sales are increased from $x = 200$ units to $x = 500$ units.

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