

Quiz questions on Sections 2.6–4.3

Calculus I

Math 180, Fall Semester 2003

Here are the questions which appeared on the quizzes covering Sections 2.6–4.3. Needless to say, they make good review problems for the Hour Exam II.

1. Sketch the graph of a function whose first derivative is everywhere negative and whose second derivative is negative for some x -values and positive for other x -values.
2. Find the slope of the line tangent to the graph of the function f at the point $(1, 1)$ where f is given by $f(x) = 2x^3 - 2x^2 + 1$.
3. 1. Using the rules for differentiation discussed in class, find the derivative of
 - (a) $2^{\sin x}$
 - (b) $(e^x - 17x)/x^2$

Indicate for each step which rule you are using!

4. If $f(1) = 3$, $f(1/2) = 1$ and $f'(1) = 2$, $f'(1/2) = 0$, what is the derivative of
 - (a) $f(4x^2)$ when $x = 1/2$?
 - (b) $f(x) \cdot 4x^2$ when $x = 1/2$?
5. Find dy/dx given the equation $x^2 + y^2 - 4xy = 11$.
6. On which intervals is $y = \ln(x^2 + 3)$ concave up?
7. Find the following limits:

(a)

$$\lim_{x \rightarrow \infty} \frac{7x^2 + 3x}{2x^2 + 1}$$

(b)

$$\lim_{x \rightarrow 0} \frac{\sin 3x}{x}$$

8. Let $f(x) = \sqrt{x^3 + 1}$. Find the linear approximation of f near $x = 2$.
9. Under what conditions on a and b does the function

$$f(x) = x^3 + ax^2 + b$$

have exactly one critical point? What is this critical point? Is it a local maximum, local minimum, or neither? Justify your answer.

10. Find the best possible A and B such that $A \leq \ln(1 + x^2) \leq B$ for all x with $-1 \leq x \leq 1$.