

Name: \_\_\_\_\_

**MA1 Exam 5 Review Sheet**

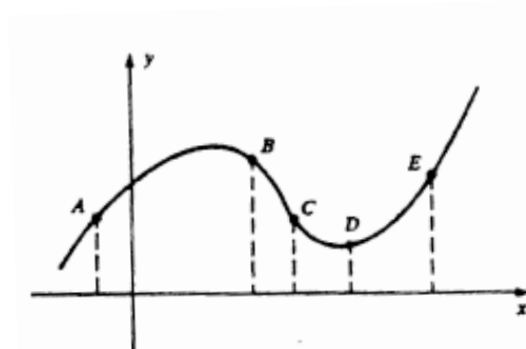
**Exam 5 will be on Tuesday, December 16, 2008.** The exam is cumulative, but the following topics will be emphasized: implicit differentiation; equations of tangent lines and normal lines; finding intervals on which a function is increasing and decreasing; finding relative and absolute extrema; concavity and inflection points; and curve sketching. *Calculators are not permitted on this exam.*

1. Find  $\frac{dy}{dx}$  if  $x + y = xy$ .
2. Find the equation of the tangent line to the graph of  $x^2 - y^2 = 27$  at the point  $(6, -3)$ .
3. Find the intervals on which  $f(x)$  is increasing:  $f(x) = x^3 + 6x^2 + 9x + 1$ .
4. For what value(s) of  $x$  does  $4x^6 - 8x^3 + 18$  have a relative minimum?
5. Find all critical points for  $f(x) = \frac{x}{x-5}$  and determine whether a relative maximum, relative minimum, or neither occurs there.
6. Let  $f$  be the function defined by  $f(x) = \frac{4x-8}{x^2+5x-14}$ . Write an equation of the line normal to the graph of  $f$  at  $x = 1$ .
7. Find the value of  $c$  if the line  $y = 4x + 3$  is tangent to the curve  $y = x^2 + c$ .
8. Find  $\frac{dy}{dx}$  at the point  $(2, -3)$  if  $y^2 - 2xy = 21$ .

9. Write the equation of the line tangent to the curve  $y = x \sin x$  at the point  $(\pi, 0)$ .

10. What are all values of  $x$  for which the graph of  $y = 6x^2 + \frac{x}{2} + 3 + \frac{6}{x}$  is concave downward?

11. If the graph at right represents  $y = f(x)$ , at which point(s) on the graph do  $f'(x)$  and  $f''(x)$  have the same sign?

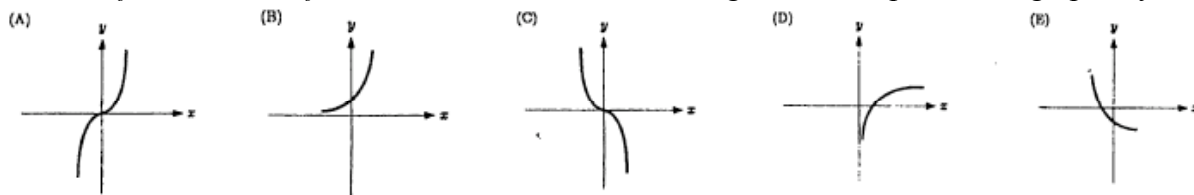


12. How many points of inflection does the graph of  $f(x) = 2x^6 + 9x^5 + 10x^4 - x + 2$  have?

13. On what interval(s) is the function  $f(x) = \frac{x^2 + 1}{x^2}$  concave upward?

14. Find the absolute maximum value and the absolute minimum value of the function  $f(x) = 3x^5 - 5x^3$  on the interval  $[-1, 2]$ .

15. If, for all  $x$ ,  $f'(x) > 0$  and  $f''(x) < 0$ , which of the following could be a part of the graph of  $f$ ?



16. The function  $y = x^4 + bx^2 + 8x + 1$  has a horizontal tangent and a point of inflection at the same value of  $x$ . What is the value of  $b$ ?

17. Sketch the graph of  $y = \frac{x^2 - 2x + 1}{x^2}$ . Plot the stationary points and the inflection points.