Bronx High School of Science
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11 December 2006

Mathematics Department
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Name: _____ **MA1 Exam 4 Review Sheet**

Exam 4 will be on Wednesday, December 13, 2006. 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 (i) increasing, (ii) decreasing, (iii) concave up, and (iv) concave down; points of inflection; and finding relative and absolute extrema. Graphing calculators are allowed on this exam, but are not required. Be sure to show all steps clearly using the calculus techniques shown in class. A correct answer with no justification will receive no credit.

1. Find $\frac{dy}{dx}$ if $x + y = xy$.

2. Find the intervals on which $f(x)$ is increasing: $f(x) = x^3 + 6x^2 + 9x + 1$.

3. For what value(s) of x does $4x^6 - 8x^3 + 18$ have a relative minimum?

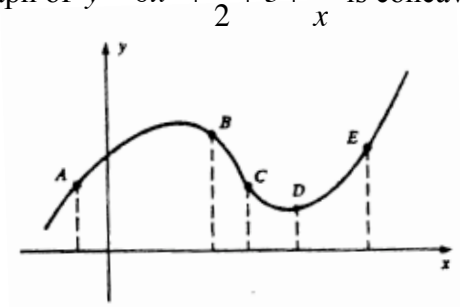
4. Let f be the function defined by $f(x) = \frac{4x-8}{x^2+5x-14}$. Write an equation of the line normal to the graph of f at $x = 1$.

5. Find the value of c if the line $y = 4x + 3$ is tangent to the curve $y = x^2 + c$.

6. Find $\frac{dy}{dx}$ at the point (2, –3) if $y^2 - 2xy = 21$.

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

8. 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?

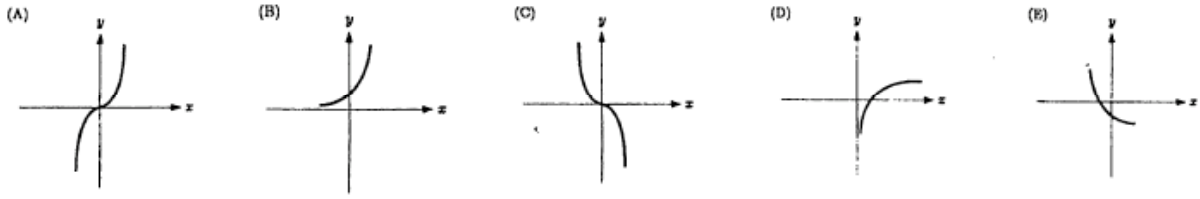


9. How many points of inflection does the graph of $f(x) = 2x^6 + 9x^5 + 10x^4 - x + 2$ have?

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

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

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



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

14. 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?