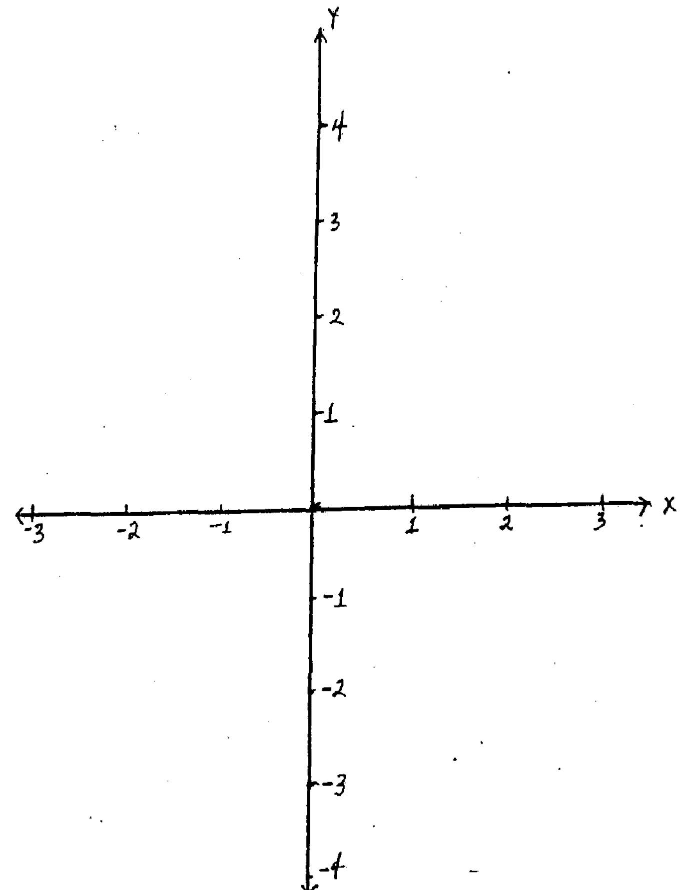
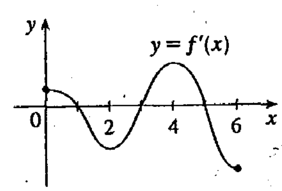
SM121 Test IV (NO CALCULATORS) 6 Dec 2010

Name____________________________ Prof. J. D'Archangelo

1. Use the sign of $f$, $f'$, and $f''$ to sketch a graph of $f(x) = x^4 - 2x^3$. (#29 Dec 2008 final exam)
Label all relative maximums and minimums and inflection points.




2. The graph of the derivative $f'$ of a function $f$ is shown.



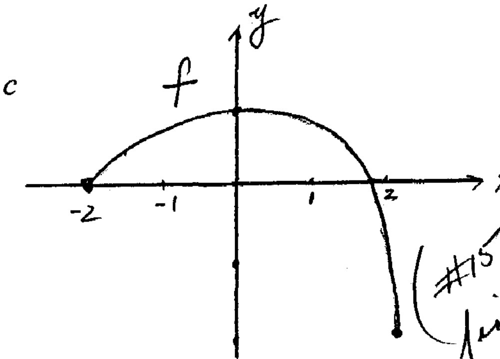

(homework problem)

a) On what intervals is $f$ increasing?

b) On what intervals is $f$ concave up?

3.a) The Mean Value Theorem states that for the function $f$ graphed on the right there is a number $c$ in the interval [ a , b ] = [ -2 , 2 ] where $f'(c) = \frac{f(b) - f(a)}{b - a}$. Based on the graph, which of the following numbers is the best estimate for $c$ ?

a) -2 b) -1 c) 0 d) 1 e) 2




(#15 Dec 2008 final exam)

3.b) Use the Mean Value Theorem to prove the following theorem.
If $f' > 0$ on and interval ( a , b ), then $f$ is increasing on ( a , b ).

(hw problem)

4. A particle moves horizontally along a line with acceleration $a(t) = e^t - \sin(t) + t$. Find its velocity $v(t)$ and position $s(t)$ if $v(0) = 3$ and $s(0) = 4$.

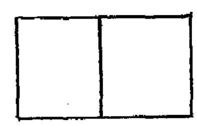
(#27b Dec 2008 final exam)

5. (a) Find $\lim_{x \to 0} \frac{x - \sin(x)}{x + \cos(x)}$.

(b) Find $\lim_{x \to 0} \frac{e^x - 1}{x^3}$.

(c) Find $\lim_{x \to 0^+} x \ln(x)$.

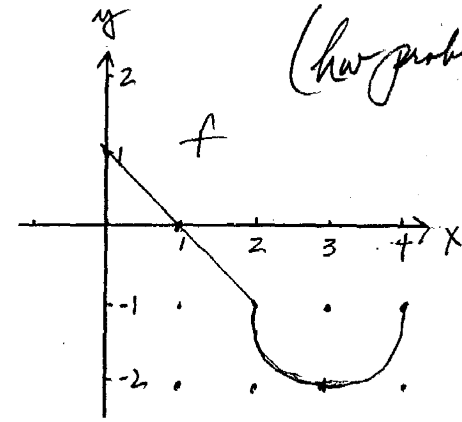
6. A farmer wants to enclose a rectangular area of 15,000 square feet, and then divide it into 2 pens with fencing parallel to one of the sides. What dimensions will minimize the cost of the fence?



(#25 Dec 2008 final exam)

(hw problem)

7. Consider the function $f$ graphed on the right consisting of a semi-circle and a line segment.




(a) Find the exact value for $\int_0^4 f(x)dx$.

(b) Approximate $\int_0^4 f(x)dx$ using $R_4$ (using right endpts and 4 subintervals) and show the rectangles you are using on the graph above.

8. Evaluate the following:

(#27(a) Dec 2008 final exam)

(a) $\int_{-1}^{2} (6x^2 + 6x + 6)\, dx$

(b) $\int \left(e^{3x} + \sec(x)\tan(x)\right) dx$