NAME_____

Math 12
Test 2
Spring 2012

You have 50 minutes to complete this test. You must *show all work* to receive full credit. Work any 7 of the following 8 problems. Clearly **CROSS OUT** the problem you do not wish me to grade. Each problem is worth 14 points, and you get 2 points for free, for a total of 100 points. The answers will be posted on the electronic reserves later today.

1. Given the function $f(x)=x^5-5x$, list the intervals where f is increasing, where it is decreasing, where it is concave up and where it is concave down. Find all extrema and inflection points. Do not sketch the graph.

2. For the following functions, find all horizontal and vertical asymptotes (remember that an asymptote is a LINE, not a number). If there are no asymptotes, say so.

a) $f(x)=\dfrac{3x^2}{x^2-16}$

b) $f(x)=\dfrac{x^2-2x-3}{x^3-5x^2+6x}$

c) $f(x)=\dfrac{4}{x^2+1}+7$

3. Suppose that at price p, demand for a certain product is given by $q(p)=10,000-500p$ when price is a positive value less than \$20.

a) Find the price elasticity of demand when price is \$5. Is demand elastic or inelastic at this price?

b) Suppose the price of \$5 is increased to \$5.15. What is the percentage increase in price?

c) If price is increased from \$5 to \$5.15, use (a) and (b) to determine the new demand amount.

4. For the function $f(x)=\frac{4x}{x^2+1}$, list the intervals where f is concave up and where it is concave down. Find all inflection points. Find all asymptotes. If any of these items do not exist, say so.

5. Find the absolute extrema of $f(x)=x^4-8x^2+16$ on the interval $[1,3]$.

6. Sketch the graph of a function $f(x)$ so that all conditions below are satisfied. Be sure your graph is big enough so I can see it and it is properly labeled.

a) $f(x)$ is defined for all x except $x=1$.

b) $f'(x)>0$ when $1<x<3$.

c) $f''(x)>0$ when $x>4$ and when $x<-1$.

d) $f(x)$ has an inflection point at (-1,2).

e) $\lim_{x\to\infty} f(x)=2$.

7. Find the equation of the line tangent to $x^4 - 2x^3y^2 = 1 - y^3$ at the point (2,1).

8. A company that makes iPad keyboard cases finds that if q packages of cases are produced in an hour, the *average* cost per package is $\bar{c} = 2q^2 - 36q + 210 - \frac{200}{q}$, where the number of packages that can be produced per hour is restricted to $2 \le q \le 10$. How many packages should be produced (within the restrictions) in order to maximize total cost? What is the minimum total cost in an hour?