EXAM 2 - MATH 112
DATE: Friday, February 20
INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. Each question is worth 3 points. It is necessary to show your work. Correct answers without explanations are worth 0 points.
GOOD LUCK!!

1. Find the derivative of the function

    (a) $f(x) = (x^2 - 4x + 1)(x^5 - 6x + 3)$

    (b) $f(x) = \frac{x^2 + 7x - 2}{6x - 7}$

    (c) $f(x) = (4x^3 - 5x + 1)^{2004}$

    (d) $f(x) = \sqrt{7x - 3}$

2. Find the points where the tangent line to the graph of $f(x) = x^3 - 12x$ is horizontal.

3. Find $\frac{dy}{dx}$ by implicit differentiation and then give an equation for the tangent line to the graph of $x^3 - xy + y^2 = 4$ at the point $(0, -2)$.

4. A water droplet causes a circular disturbance on the surface of a pool. If the radius changes at a rate of $\frac{1}{2}$ft/sec, what is the rate of change of the area of the disturbance when the radius is 2 ft?

5. Do the following in the order indicated for the function $f(x) = x^3 - x$.

    (a) Find the x- and y-intercepts.

    (b) Find the first derivative and its zeros.

    (c) Find the second derivative and its zeros.

    (d) Create the sign table and clearly show on the table intervals of monotonicity and concavity, relative extrema and inflection points.

    (e) Roughly sketch the graph of the function.

6. Do the following in the order indicated for the function $f(x) = \frac{x+1}{x-2}$.

    (a) Find the x- and y-intercepts.

    (b) Find horizontal and vertical asymptotes if any.

    (c) Find the first derivative and its zeros.

    (d) Find the second derivative and its zeros.

    (e) Create the sign table and clearly show on the table intervals of monotonicity and concavity, relative extrema and inflection points.

    (f) Roughly sketch the graph of the function.