HOMEWORK 3 - MATH 112 DUE DATE: Monday, February 9 INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. One part of each problem will be chosen at random and graded. Each question is worth 1 point. 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)
$$f(x) = \frac{1}{(x^2 - 3x)^2}$$

- (b) $f(x) = x(3x 9)^3$ (c) $f(x) = \sqrt{\frac{3-2x}{4x}}$
- (d) $f(x) = (\frac{6-5x}{x^2-1})^2$
- 2. Find an equation of the tangent line to the graph at the indicated point.
 - (a) $f(x) = (x^2 9)\sqrt{x + 2}$ at (-1, -8)
 - (b) $f(x) = \frac{x+1}{\sqrt{2x-3}}$ at (2,3)
- 3. Find the second derivative of the function
 - (a) $f(x) = x^2 + 7x 4$ (b) $f(x) = \frac{3}{4x^2}$ (c) $f(x) = \frac{x+1}{x-1}$
- 4. Find the indicated derivative
 - (a) Given $f''(x) = \frac{2x-2}{x}$ find f'''(x)(b) Given $f^{(4)}(x) = (x+1)^2$ find $f^{(6)}(x)$.
- 5. Find $\frac{dy}{dx}$

(a)
$$4y^2 - xy = 2$$

(b) $\frac{2-x}{y-3} = 5$

- 6. Find $\frac{dy}{dx}$ by implicit differentiation and evaluate the derivative at the indicated point
 - (a) $x^3y^3 y = x$ at (0,0) (b) $x^{\frac{1}{2}} + y^{\frac{1}{2}} = 9$ at (16,25) (c) $x^{\frac{2}{3}} + y^{\frac{2}{3}} = 5$ at (8,1)
- 7. A spherical balloon is inflated with gas at the rate of 20 cubic feet per minute. How fast is the radius of the balloon changing at the instant the radius is 2 feet?
- 8. A retail sporting goods store estimates that weekly sales S and weekly advertising costs x are related by the equation $S(x) = 2250 + 50x + 0.35x^2$. The current weekly advertising costs are \$1500 and these costs are increasing at a rate of \$125 per week. Find the current rate of change of weekly sales.