1. a) (7pt) List all points where the function

\[ f(x) = \frac{x}{x^2 - 3x + 2} \]

is NOT continuous.

b) (8pt) Find

\[ g(x) = \lim_{x \to 2^-} \frac{x}{x^2 - 3x + 2}. \]
2. Evaluate limits.

a) (5pt)
\[ \lim_{x \to \infty} \frac{2x^6 - 3x^3 - 1}{1 + x + 7x^6}; \]

a) (7pt)
\[ \lim_{x \to \infty} \frac{\sqrt{x^2 + x - 1}}{x + 2}; \]

a) (8pt)
\[ \lim_{x \to \infty} \frac{\sqrt{x^2 + \sqrt{x^4} + 1} - x}{x}. \]
3. Find the derivative of \( f(x) = \frac{1}{x^2} \) using the definition of the derivative. (You are not supposed to use the power rule in this problem!)
   a) (3pt) Write the definition of \( f'(x) \);

b) (2pt) Apply the definition of derivative to the function \( f(x) = \frac{1}{x^2} \);

c) (10pt) Find \( f'(x) \) by evaluating the limit in b).
4. A circular oil spill is expanding in the ocean with its area increasing with the constant rate of 100 m$^2$ per hour. How fast is the radius of the spill is increasing when the spill area is $\pi 10^6$ m$^2$? Recall, that area of the circle of the radius $r$ is given by $A = \pi r^2$. 
5. Use chain rule to evaluate the following derivatives

a) (5pt) Find $f'(x)$ if
$$f(x) = (\sin x + 3x)^{10}$$

b) (5pt) find $h'(x)$ if
$$h(x) = \sqrt{\tan(x^2 + 1)}$$

b) (5pt) find $g'(x)$ if
$$g(x) = \arcsin\left(\frac{x^2}{x^2 + 1}\right)$$
6. (15pt) Use implicit differentiation to find $y'(0)$ from

$$\frac{1}{y} \cos(xy) = 1 - y^2 + x.$$ 

if $y = 1$ when $x = 0$. 