Exam 2

Your name:

100 points total

Your TA's name:

1. Find the derivative of the function by any appropriate method.

(a) [10 points] $f(x) = \dfrac{1 + 3\ln x}{1 - 3\ln x}$

(b) [10 points] $y = (\sin x)^x$

(c) [10 points] $f(x) = \tan^{-1}(e^{2x})$

2. [15 points] Jim has 20 feet of fencing and wishes to make a rectangular fence for his dog. If he uses his house for one side of the fence what is maximum area?

3. Evaluate the limits

(a) [10 points] $\lim_{x \to 0} \dfrac{\tan x}{\sqrt{x}}$

(b) [10 points] $\lim_{x \to \infty} \frac{3^x}{x^3}$

4. [10 points] Find $f(x)$ in the most general form if $f''(x) = \sin x + 6$.

5. [10 points] Prove that there is a number c inside the interval $[1, 4]$ where the derivative of the function $f(x) = \dfrac{x}{x+2}$ attains the value $\dfrac{1}{9}$.

6. [15 points] For the function

$$f(x) = \frac{x-2}{x^2} = x^{-1} - 2x^{-2}$$

find its domain, intercepts, asymptotes, intervals of increase or decrease, local maximum and minimum values, concavity, inflection points, and sketch its graph.

Bonus problem. [10 points extra] What approximately is $\sqrt{15.98}$? Use linear approximation to find the value.