I have done all.
pls Correct if mistake
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CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number	Section
Mathematics	203	AA
Examination	**Date**	**Duration**
Midterm Test	May 28th, 2013	1 h 30 min
Special Instructions:	Only approved calculators are allowed **Show all your work**	

1. (6 marks): Solve for x (find the *exact* values, do not approximate)

   (a) $\ln 2 + \ln(x+2) - \ln(x-1) = 3\ln 2$

   (b) $9^{\log_3 x} - 4x = 0$

2. (6 marks) (a) Let $f(x) = \dfrac{e^x}{x+1}$ and $g(x) = \sqrt{1-x}$. Find the composite functions $f \circ g$ and $f \circ f$, and determine their domains.

   (b) Given the function $f(x) = \dfrac{x+1}{2x+1}$, find the inverse function f^{-1} and the domain and the range of f^{-1}.

3. (8 marks) Find the limit or explain why the limit does not exist:

   (a) $\lim\limits_{x\to 0} \dfrac{\sqrt{1+x} - \sqrt{1-x}}{x}$

   (b) $\lim\limits_{x\to -2} \dfrac{2-|x|}{2+x}$

4. (5 marks) Find all horizontal and vertical asymptotes, as well as $x-$ and $y-$intercepts of the graph $y = \dfrac{2x-1}{\sqrt{4x^2-100}}$.

(continued on the other side)

5. (16 marks). Find the derivatives of the following functions (you don't need to simplify the final answer, but you must show how you calculate it):

(a) $f(x) = \dfrac{e^{3x}}{1+e^{x}}$

(b) $f(x) = \dfrac{1-\tan x}{\cos x \, \sin x}$

(c) $f(x) = (2\pi + e^{2x})\, 2^{x}$

(d) $f(x) = \sin^{3}\left(\tan\left(\sqrt{\sin x}\right)\right)$

6. (9 marks) Given the function $f(x) = x^2 - 3x$:

(a) Calculate $f'(x)$ using its definition as a limit (of difference quotient).

Check that your calculation is correct using standard rules for differentiation of power functions.

(b) Find the equation of the tangent line to the graph of $f(x)$ at the point $(1, -2)$.

(c) Compute the average rate of change of $f(x)$ on the interval $[0, 4]$.

Bonus Question (3 marks) Find dy/dx by implicit differentiation if

$$2\sqrt{x} + \sqrt{y} = 3 \, .$$