CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number	Sections
Mathematics	203	All
Examination	**Date**	**Duration**
Midterm	21 October, 2012	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) $\log_7(x+3) + \log_7(x-3) = 1$

    (b) $e^{5-3x} = 10$

2. (6 marks) (a) Let $f(x) = \sqrt{4-2x}$ and $g(x) = 2 - x^2$. Find the composite functions $f \circ g$ and $g \circ f$, and determine their domains.

    (b) For the given one-to-one function $f(x) = \dfrac{4-x}{3+x}$ find the inverse function f^{-1} and the domain of f^{-1}.

3. (6 marks) Evaluate the limit or explain why the limit does not exist:

    (a) $\lim\limits_{x \to 1} \dfrac{x^2 + x - 2}{x - 1}$

    (b) $\lim\limits_{x \to -7} \dfrac{2x + 14}{|x + 7|}$

4. (4 marks) Find all horizontal and vertical asymptotes of the graph of the function $f(x) = \dfrac{2x + 3}{\sqrt{x^2 - 2x - 3}}$.

5. (13 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) $f(x) = 5x^3 - 7\sqrt{x} + \dfrac{1}{x}$

(b) $f(x) = \dfrac{1 + \sin x}{\tan x}$

(c) $f(x) = (1 - x)\,e^{2x}$

(d) $f(x) = \cos(\sin(2x + \cos^2 x))$

6. (5 marks) (a) Let $g(x) = \sqrt{9 - x}$. Find $g'(5)$ using the definition of the derivative as the limit of the difference quotient.

(b) Use the answer to part (a) to find the equation of the tangent line to $g(x)$ at the point $(5, g(5))$.

Bonus Question (2 marks).

Recall that $f(x)$ is an even function if it does not change when x is changed to $-x$, and an odd function if it changes sign, but not the absolute value, when x is changed to $-x$. Use the Chain Rule to prove that the derivative of an even function is an odd function and the derivative of an odd function is an even function.