UNIVERSITY OF MANITOBA

NAME: (Print in ink) _____

STUDENT NUMBER: _____

SIGNATURE: (in ink) _____
                        (I understand that cheating is a serious offense.)

❑ A01   ❑ A02   ❑ A03   ❑ A04
   B. Waters   S. Kalajdzievski   N. Harland   X. Zhao
   MWF 10:30-11:20   MWF 9:30-10:20   MWF 11:30-12:20   MWF 12:30-13:20

❑ A05   ❑ A06   ❑ A07   ❑ A08
   D. Krepski   L. Menjivar   F. Ghahramani   X. Zhao
   TTh 11:30-12:45   T 19:00-22:00   TTh 10:00-11:15   MWF 8:30-9:20

❑   Challenge for credit

INSTRUCTIONS TO STUDENTS:

This is a 1 hour exam. **Please show your work clearly.**

No aids or electronic devices of any kind are permitted during the examination.

This exam has a title page, 6 pages of questions and also 1 blank page for rough work. Please check that you have all the pages. You may remove the blank pages if you want, but be careful not to loosen the staple.

The value of each question is indicated in the lefthand margin beside the statement of the question. The total value of all questions is 60 points.

Answer all questions on the exam paper in the space provided beneath the question. If you need more room, you may continue your work on the reverse side of the page, but CLEARLY INDICATE that your work is continued.

Show all your work clearly and justify your answers (unless it is explicitly stated that you do not have to do that). **Unjustified answers will receive LITTLE or NO CREDIT.**

Question	Points	Score
1	14	
2	9	
3	6	
4	8	
5	3	
6	5	
7	6	
8	9	
Total:	60	

1. Calculate each of the following limits if they exist. If the limit does not exist, determine whether the limit is ∞, $-\infty$ or neither.

[4]   (a) $\lim\limits_{x \to 0} \dfrac{\sqrt{x^2 + 1} - 1}{x}$

[3]   (b) $\lim\limits_{x \to -1^+} \dfrac{2x - 3}{x^2 - 1}$

[4]   (c) $\lim\limits_{x \to -\infty} \dfrac{\sqrt{2x^2 + 1}}{x + 2}$

[3]   (d) $\lim\limits_{x \to 0} \dfrac{\tan x}{x}$

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DEPARTMENT & COURSE NO: MATH 1500   TIME: 1 hour
EXAMINATION: Introduction to Calculus   EXAMINER: various

2. For each of the functions $f(x)$, calculate $f'(x)$. Do not simplify your answers.

[3]   (a) $f(x) = (4 - x^2)e^x$

[3]   (b) $f(x) = \dfrac{x^2 + 1}{\cos x + 1}$

[3]   (c) $f(x) = \tan(1 + \sin x)$

3. The function f is defined by:

$$f(x) = \begin{cases} x^2 & x < 1, \\ 2 & x = 1, \\ e^{x-1} & x > 1. \end{cases}$$

[4]　　　(a) Determine $\lim\limits_{x \to 1^-} f(x)$ and $\lim\limits_{x \to 1^+} f(x)$.

[2]　　　(b) Is f continuous at $x = 1$? JUSTIFY YOUR ANSWER.

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DATE: October 28, 2014
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DEPARTMENT & COURSE NO: MATH 1500
TIME: 1 hour

EXAMINATION: Introduction to Calculus
EXAMINER: various

[8] 4. Let

$$f(x) = \frac{1}{x}.$$

By using the definition of the derivative, calculate the derivative $f'(x)$. No marks will be given for any other method.

[3] 5. Suppose that the function f is differentiable for all real numbers and the function g is defined by $g(x) = f(x^2 + 1)$. Suppose also that $f'(2) = -1$. By using the chain rule, calculate $g'(1)$.

[5] 6. Prove the addition rule for derivatives:

if $f'(x)$ and $g'(x)$ exist, then

$$(f(x) + g(x))' = f'(x) + g'(x).$$

[6] 7. Determine an equation of the tangent line to the curve $y^2 - xy + x^2 = 1$ at the point $(1, 1)$ on the curve.

[9]   8. Turtle A is walking west, along a straight road, at $20\,m/h$ and turtle B is walking north, along a straight road, at $30\,m/h$. Both are headed for the intersection of their paths. At what rate is the distance between the turtles changing when turtle A is 4 metres and turtle B is 3 metres from the intersection of the two roads?