THE UNIVERSITY OF MANITOBA

MT 1

October 8, 2009

TRITERM EXAMINATION

TITLE PAGE

DEPARTMENT & COURSE NO: MATH 1700

TIME: 1 Hour

EXAMINATION: Calculus 2

EXAMINER: Korytowski

FAMILY NAME: (Print in ink) _____

GIVEN NAME: (Print in ink) _____

STUDENT NUMBER: (Print in ink) _____

SIGNATURE: (Sign in ink) _____

(I understand that cheating is a serious offense)

Please mark your section number

- ☐ A01 MWF (8:30 – 9:20) W. Korytowski
- ☐ A02 T & R (1:00 – 2:15) W. Korytowski

INSTRUCTIONS TO STUDENTS:

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

No calculators, texts, notes, cell phones, translators or other aids are permitted.

This exam has a title page, 4 pages of questions and 1 blank page at the end for rough work. Please check that you have all the pages.

The value of each question is indicated in the left-hand margin beside the statement of the question. The total value of all questions is 60.

Answer all questions on the exam paper in the space provide 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.

DO NOT WRITE IN THIS COLUMN
1. _____ /12
2. _____ /28
3. _____ / 8
4. _____ / 7
5. _____ / 5
TOTAL _____ /60

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Values

[12] 1. Evaluate.

(a) $\lim_{x\to 2}\dfrac{e^{x^2}-e^4}{x^2-4}$

(b) $\lim_{x\to 0^+}(\sin x)^{\frac{3}{\ln x}}$

[28] 2. Consider the parametric equation: $x = t^3 - 3t, \quad y = t^2 + 1.$

(a) Find the *x* and *y* intercepts (if they exist.).

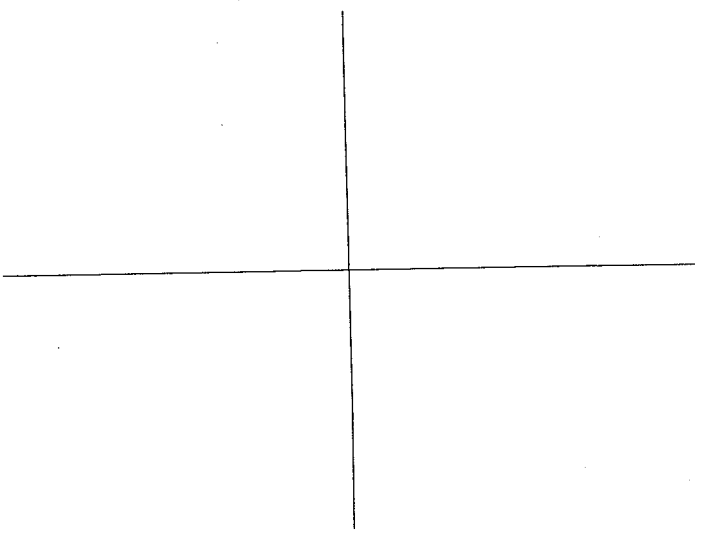
(b) Determine the four limits $\lim_{t\to\pm\infty} x$ and $\lim_{t\to\pm\infty} y$. If the limit does not exist indicate if the trend is to $+\infty$ or $-\infty$.

(c) (i) Find the coordinates of the point(s) where the curve has horizontal tangent line(s).
(ii) Find the coordinates of the point(s) where the curve has vertical tangent line(s).

(d) (i) Set up a "derivative table" indicating the signs of the derivatives and concluding with the direction of the curve in appropriate regions of this sign diagram.

(ii) Determine the intervals of t in which the curve is concave up and in which it is concave down.

(e) Sketch the parametric curve. Incorporate what you discovered in parts (a) through (d) and what you can learn from the derivative table.



[8] 3. Sketch the graph of the curve given in polar coordinates by

$r = 1 + 2\cos\theta,\ 0 \le \theta \le 2\pi$

Indicate the polar coordinates of all the intercepts on your graph.

[7] 4. Find an equation of the tangent line to the polar curve defined by $r = \sin(3\theta)$

at the point where $\theta = \frac{\pi}{4}$

[5] 5. Consider the parametric equation: $x = t^2,\ y = t^3 - 2t$.

Find $\frac{d^3y}{dx^3}$. DO NOT SIMPLIFY YOUR FINAL ANSWER.