Simon Fraser University
Department of Mathematics
Burnaby Campus

MATH 152-3, **Calculus II**
Spring 2006 – Midterm 2
March 8th, 2006, 8:30 – 9:20

Last Name (please print): _____

First Name (please print): _____

SFU email ID: _____

Instructor: P. Menz

Instructions:

1. DO NOT OPEN THIS BOOKLET UNTIL TOLD TO DO SO.
2. Fill in the above box.
3. This exam contains 7 pages with a total of 4 questions. Once the exam begins please check to make sure your exam is complete.
4. **SHOW ALL YOUR WORK!**
5. If you run out of space in a problem, use the space on the back of the previous page and clearly indicate where the solution continues.
6. **Only** scientific, non-programmable calculators with no differentiation and integration capabilities are allowed.
7. No book, paper, or device, other than the usual writing instruments, this booklet and an acceptable calculator, shall be within reach of a student during the examination.
8. During the examination, speaking to, communicating with, or deliberately exposing written papers to the view of other examinees is forbidden.

Do not write in this table!	
Question	**Marks**
1 a),b)	**/6**
1 c),d)	**/6**
1 e),f)	**/6**
2	**/4**
3	**/4**
4	**/4**
Total	**/30**

1. Compute the following indefinite integrals and describe which methods you used. **[3 marks each = 18 marks]**

a) $\int \frac{x^2 - 2x + 1}{x^3 + x} dx$

b) $\int \sqrt{x} \ln x \, dx$

c) $\int \tan^3 x \sec^3 x \, dx$

d) $\int \frac{1}{(\sin x \cos x)^{-1}} dx$

e) $\int \frac{1}{\left(x^2+9\right)^{3/2}} dx$

f) $\int \frac{x^2+1}{\sqrt[3]{x}} dx$

2. Rain is falling over a 4 hour period with the following rate data taken at 30 minute intervals.

t (h)	0	0.5	1	1.5	2	2.5	3	3.5	4
r (mm/h)	1	1.4	2	1.7	1.5	0.8	0	0.5	1

a) Use the Trapezoidal Rule with $n = 4$ to approximate the total amount of rain that fell in the 4 hour period. **[3 marks]**

b) What can be done to achieve a better approximation still using the Trapezoidal Rule with the given data? **[1 mark]**

3. Label the following integrals as **I** – for improper – or **P** – for proper. **[4 marks]**

a) ☐ $\int_{-\infty}^{3} e^{x^2+1}\,dx$

b) ☐ $\int_{-1}^{2} 1+x^{-3/2}\,dx$

c) ☐ $\int_{-1}^{0} \cos(\ln(1-x))\,dx$

d) ☐ $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} \frac{\sec x}{4+\tan x}\,dx$

4. Without providing any reasons, label the following statements as **T** – for true – or **F** – for false. **[4 marks]**

a) ☐ $\int_0^{\pi} \sqrt{1+(\sin x)^2}\, dx$ computes the arc length of $y = \sin x$ for $0 \le x \le \pi$.

b) ☐ $\int_a^b 2\pi x \sqrt{1+\left[f'(x)\right]^2}\, dx$ computes the surface area of the solid obtained by rotating $y = f(x), a \le x \le b$ about the *y*-axis.

c) ☐ ds is the arc length differential described by $\sqrt{1+\left[f'(x)\right]^2}\, dx$ for $y = f(x)$.

d) ☐ For a parametric curve described by $x = f(t), y = g(t)$ the slope is given by $\frac{dy}{dx} = \frac{dy}{dt} \cdot \frac{dx}{dt}$.