Math 1B — First Midterm
V.Jones, Spring 1998

150 points total. The first 5 questions are Multiple Choice.
For each question mark an × in the most correct place
in the grid below. No partial credit for 1–5.
Questions 6 and 7 are not multiple choice.

	a	b	c	d	e
1					
2					
3					
4					
5					

MC _____

6 _____

7 _____

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Math 1B Midterm
Multiple Choice Questions. Each multiple choice question worth 15 points.

1. Which of the following formulas is correct?

   a) $\int u(x)v(x)dx = (\int u(x)dx)v(x) + u(x)\int v(x)dx$

   b) $\int u(x)v(x)dx = \int u(x)dx + \int v(x)dx$

   c) $u(x)v(x) = \int u(x)v'(x)dx + \int u'(x)v(x)dx$

   d) $\int u(x)v(x)dx = \int u(x)v'(x)dx + \int u'(x)v(x)dx$

   e) $\int u(x)v(x)dx = (\int u(x)dx)v'(x) + (\int v(x)dx)u'(x)$

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2. If you wanted to expand
$$\frac{2x+7}{(x+1)^2(x^2+x+19)^2}$$
in partial fractions you would use the sum:

a) $\dfrac{A}{2x+7} + \dfrac{B}{(2x+7)^2} + \dfrac{C}{(2x+7)^3} + \dfrac{D}{(2x+7)^4} + \dfrac{E}{(2x+7)^5}$

b) $\dfrac{A}{x+1} + \dfrac{B}{(x+1)^2} + \dfrac{Cx+D}{x^2+x+19} + \dfrac{Ex+F}{(x^2+x+19)^2}$

c) $\dfrac{A}{x+1} + \dfrac{B}{(x+1)^2} + \dfrac{C}{x^2+x+19} + \dfrac{D}{(x^2+x+19)^2}$

d) $\dfrac{Ax+B}{(x+1)^2} + \dfrac{Cx+D}{(x^2+x+19)^2}$

e) $2x+7 + \dfrac{A}{(x+1)^2} + \dfrac{B}{(x^2+x+19)^2} + \dfrac{2x+7}{x+1} + \dfrac{2x+7}{(x^2+x+19)^2}$

3. Which of the following functions **cannot** be integrated in terms of elementary functions?

a) $x^2 \ln x$

b) $x^2 e^{x^2}$

c) $e^x \sin x$

d) $\dfrac{1}{x \ln x}$

e) $x \sin(x^2)$

4. Which of the following statements is always correct for a function $f(x)$ with $0 \le f(x) \le C$?

    a) If $\displaystyle\int_1^\infty f(x)dx$ converges, so does $\displaystyle\int_1^\infty \sqrt{f(x)}dx$.

    b) If $\displaystyle\int_1^\infty f(x)dx$ converges, so does $\displaystyle\int_1^\infty f(x)^{-2}dx$.

    c) If $\displaystyle\int_1^\infty f(x)dx$ diverges, so does $\displaystyle\int_1^\infty \frac{f(x)}{\sqrt{x}}dx$.

    d) If $\displaystyle\int_1^\infty f(x)dx$ converges, so does $\displaystyle\int_1^\infty \frac{f(x)}{1+x} \, dx$.

    e) If $\displaystyle\int_1^\infty f(x)dx$ diverges, so does $\displaystyle\int_1^\infty f(x)^p dx$ for $p > 1$.

5. Which of the following statements is correct?

    a) The error bound for Simpson's rule is improved by a factor of 16 by doubling the number of points at which the function is evaluated.

    b) The trapezoid rule is exact for quadratic functions.

    c) There is no need to use Simpson's rule for any function involving sines, cosines and polynomials since it can always be integrated in terms of sines, cosines and polynomials.

    d) The error bound for the midpoint rule is $|E_M| \le \dfrac{\max_{a \le x \le b} (|f^{(3)}(x)|)(b-a)^3}{24n^2}$

    e) Simpson's rule uses the best *linear* approximation to $f(x)$ on small intervals.

Not Multiple Choice

6. *(25 pts)* Find the arc-length function for the curve $y = \dfrac{x^2}{8} - \ln x$, starting at $(1, \frac{1}{8})$. (Evaluate the integral.)

7. Evaluate the following indefinite integrals:

(i) *(10 pts)* $\displaystyle \int \frac{1}{(x+3)(x-2)}\,dx$

7.(ii) *(20 pts)* $\int (\ln x)^2 dx$

7.(iii) *(20 pts)* $\int \dfrac{1}{\sqrt{1 - 4x^2}} \, dx$