Math 1B

Test 1 Review

For problems 1 through 4 a calculator may NOT be used.

1. Evaluate the following integrals.

   a) $\displaystyle\int (\tan x)[\ln(\cos x)]\, dx$

   b) $\displaystyle\int \cos x\, e^{5x}\ dx$

   c) $\displaystyle\int \frac{9x-12}{x^3-x^2-6x}\, dx$

   d) $\displaystyle\int \sqrt{36-x^2}\, dx$

   e) $\displaystyle\int_0^{\pi/2} \cos^3 x \sin^8 x\, dx$

   f) $\displaystyle\int_4^6 \frac{1}{\sqrt{x-4}}\, dx$

   g) $\displaystyle\int_0^{\infty} xe^{-x}\, dx$

2. The *Gamma Function*, $\Gamma(n)$ is defined by: $\Gamma(n) = \displaystyle\int_0^{+\infty} x^{n-1}e^{-x}dx$, $n > 0$. Evaluate this function at $n = 4$.

3. Consider the function $y = \dfrac{x^4}{8} + \dfrac{1}{4x^2}$ over [1, 2].

   a) Find $\dfrac{dy}{dx}$.

   b) Find the exact value of the arc length of the curve.

4. Select the most appropriate technique for finding the antiderivatives from the given list. Write the letter corresponding to the method in the given space. A method may appear more than once in the list of answers, but only one answer per integral.

_____ a) $\int \cos^2 x \, dx$

_____ b) $\int \frac{3x^2 - 2}{x^2 - 2x - 8} \, dx$

_____ c) $\int \frac{e^{\tan^{-1} x}}{1 + x^2} \, dx$

_____ d) $\int x^4 \ln x \, dx$

_____ e) $\int \frac{1}{x\sqrt{4x^2 + 1}} \, dx$

TECHNIQUES

A. u-substitution

B. Parts

C. Trig Identity

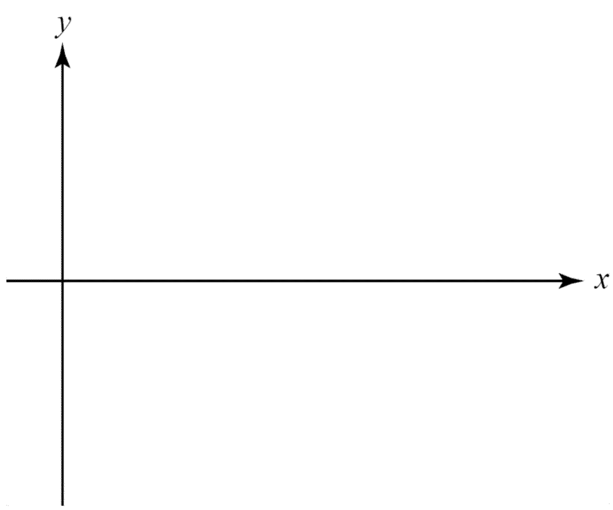
D. Trig substitution

E. Partial Fractions

A calculator may be used to help solve problems 5 and 6.

5. Consider the function $f(x) = \ln x$ over the interval $[1, e]$.

a) Sketch a graph of the function.



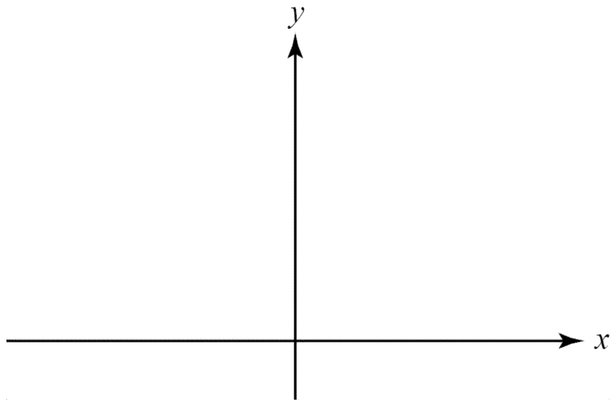
b) Write an integral that will determine the volume obtained by rotating the region bounded by the curve $f(x) = \ln x$, the x–axis and $x = e$ about the x-axis.

c) Write an integral that will find the length of the arc for the curve $y = \ln x$ over the interval $[1, e]$.

d) Evaluate the integrals you found in parts (b) and (c).

6. Consider the curve $y = \sin x$ over the interval $[0, \pi]$.

a) Sketch a graph of the function.



b) Write an integral that will determine the volume obtained by rotating the region bounded by the curve $y = \sin x$ and the x–axis about the y–axis.

c) Write an integral that will find the length of the arc for the curve $y = \sin x$ over the interval $[0, \pi]$.

d) Evaluate the integrals you found in parts (b) and (c).