

1. Evaluate the following integrals:

(a) [9 points] $\int x \ln x \, dx$

(b) [9 points] $\int x^3 e^{x^2} \, dx$ [Hint: Make a substitution first.]

(c) [9 points] $\int_0^1 \frac{1}{(x^2 + 1)^{3/2}} dx$

(d) [9 points] $\int \cos(\ln x) dx$ [Hint: Use integration by parts.]

(e) [9 points] $\int 2 \sin(2x) \sin^2(x) dx$

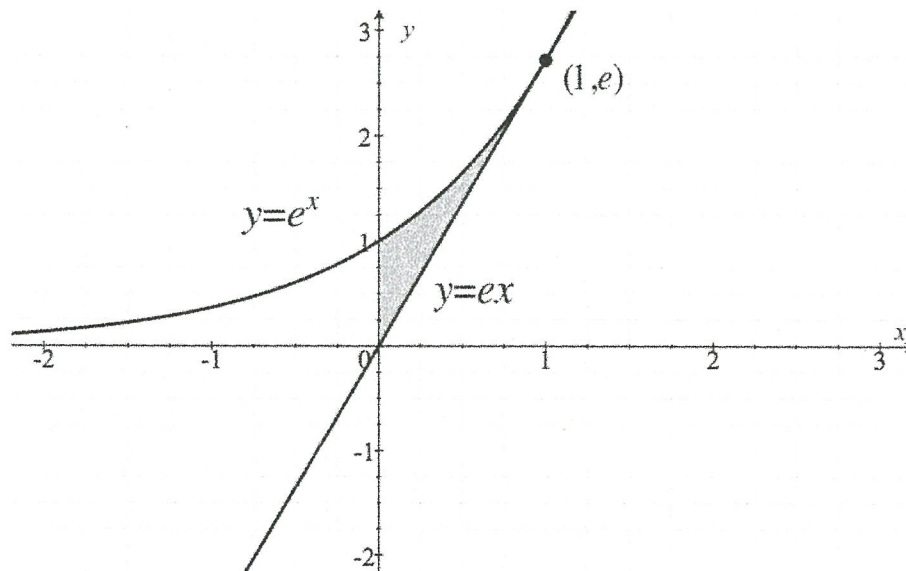
(f) [9 points] $\int \frac{5x - 1}{(x - 1)(x - 2)} dx$

(g) [9 points] $\int \sqrt{25 - x^2} dx$

(h) [9 points] $\int \frac{2x^2 + x - 1}{(x - 3)(x^2 + 1)} dx$

DO NOT WRITE ABOVE THIS LINE!!

2. (~~10 points~~) Let R be the region bounded by the graphs of $y = e^x$, $y = ex$ and the y -axis.



Set up but do not compute an integral expression for the

(a) (~~4~~ points) area of R ,

(b) (~~6~~ points) volume of the solid of revolution obtained by rotating R about the x -axis.

3. [9 points] Determine if the integral $\int_1^{\infty} \frac{x}{x^2 + 4} dx$ converges or diverges by evaluating the integral.

4. [9 points] Determine if the integral $\int_0^{\infty} \frac{1 + \sin x}{e^x} dx$ converges or diverges.