

## Honors Calculus, Midterm 2 Sample 2.

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*Please write your answers clearly and in a logical and well-organized way. Points will be deducted for sloppy work. Attempt all questions. All questions are of equal value.*

(1)[20 points] Evaluate the following definite or indefinite integrals:

(a)  $\int_0^1 x^2 \sqrt{1-x^3} dx$

(b)  $\int \frac{1}{\sqrt{1+x}} dx$

(c)  $\int \frac{1}{x(\ln x)} dx$

(d)  $\int \frac{1}{x^2+9} dx$

(2)[10 points] Find the area bounded by the curves  $y = x$  and  $y^2 + 2x = 6$ .

(3) [6 points] Does the improper integral

$$\int_0^1 \ln x dx$$

converge? If so to what limit?

Does the improper integral

$$\int_0^2 \frac{1}{|x-1|^{1/2}} dx$$

converge? If so to what limit?

(4) [9 points] The area bounded by  $y = x^2$ ,  $x = 1$ ,  $x = 2$  is rotated about the axis  $x = -1$ . Find the volume of the resulting solid by both (a) method of cylindrical shells and (b) the method of cross-sectional area.

(5) [5 points] Find (a)

$$\int \frac{x}{(x-1)(x+1)(x+2)} dx$$

(b) [5 points] Show, by comparing the integrand to a simpler integrand, that

$$\int_0^1 \sqrt{x^4 + 1} \geq \frac{1}{2}$$