Honors Calculus, Midterm 2 Practice 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) $\frac{\sqrt{2}}{x^2+1} \, dx$

(b) $\int \frac{(x-1)^2}{(x-2)^2} \, dx$

(c) $\int \ln x \, dx$

(d) $\int x^2 e^{3x} \, dx$

(2)[10 points] Find the area bounded by the curves $y = x$, $y = \frac{1}{x}$, $x = 0$ and $y = \frac{x}{2}$.

(3) [5 points] A solid is obtained by rotating the region bounded by $y = \sin x$, $y = \cos x$ and $x = 0$ about the line $x = -1$.

Set-up the integral that would calculate the volume of the solid by the method of cylindrical shells and the cross-sectional method. **You do not need to evaluate the integrals, merely correctly formulate them.**

(4) [10 points] The area bounded by $y = x^{2/3}$, $x = 5$, $y = 1$ is rotated about the y axis. Find the volume of the resulting solid by both (a) method of cylindrical shells and (b) the method of cross-sectional area. **In this case you do need to evaluate the integral you set-up.**

(5) [5 points] Find (a)
$$\int \frac{1}{(x^2 + 1)(x - 2)}\,dx$$

(b) [5 points] By comparing $\frac{x^2}{x^5 + x^2 + 1}$ to simpler functions show

$$\frac{1}{9} \le \int_0^1 \frac{x^2}{x^5 + x^2 + 1}\,dx \le \frac{1}{3}$$