Honors Calculus, Midterm 2 Sample 3.

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Please write your answers clearly and in a logical and well-organized way. Points will be deducted for sloppy work.

Good Luck!.

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

(a) $\int \frac{\pi}{x^2+1} \, dx$

(b) $\int \frac{x^2}{(x-4)^2} \, dx$

(c) $\int (\ln \theta)^2 \, d\theta$

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

(2)[10 points] (a) Find the area bounded by the curves $y = \cos^2(x)$, $y = \sin^2(x)$, $x = 0$ and $x = \frac{\pi}{4}$.

(b) Find the arc-length of the curve $y = e^x$, over the interval $0 \le x \le 2$.

(3) [10 points] A solid is obtained by rotating the region bounded by $y = 2x^{1/3}$ and $y = 2x^3$ about the line $x = -2$.

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

(4) [10 points] The area bounded by $y = 4 - x^2$, $x = 2$, $y = 4$ 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**.