

AP Calculus Exam Prep Assignment #4 page 2

7) $\int_0^{\pi/4} \pi(\sec x)^2 dx = \pi[\tan x]_0^{\pi/4} = \pi[1-0] = \pi$ **C)**

8) $u = 5x \quad du = 5dx \Rightarrow dx = \frac{du}{5} \quad \int_5^{10} \frac{\sqrt{u} du}{5} = \frac{1}{5} \left[\frac{2u^{3/2}}{3} \right]_5^{10} = \frac{2}{15} [10^{3/2} - 5^{3/2}] \approx 2.726$ **A)**

9) The region in the first quadrant enclosed by the y -axis and the graphs of $y = \cos x$ and $y = x$ is rotated about the x -axis. The volume of the solid generated is:

$V = \pi \int_0^{0.739} (\cos^2 x - x^2) dx \approx 1.520$ **C)**

10) $u = x^2 \quad du = 2x dx \Rightarrow x dx = \frac{du}{2} \quad \int \frac{e^u du}{2} = \frac{1}{2} e^u + C = \frac{1}{2} e^{x^2} + C$ **A)**

11)

$$\begin{array}{llll} u = x^2 & dv = e^x dx & x^2 e^x - \int 2x e^x dx & u = 2x \quad dv = e^x dx \\ du = 2x dx & v = e^x & & du = 2 dx \quad v = e^x \end{array} \quad \mathbf{C)}$$

$x^2 e^x - (2x e^x - \int 2e^x dx) = x^2 e^x - 2x e^x + 2e^x + C$

12) $u = \ln v \quad du = \frac{1}{v} dv \quad \int u du = \frac{u^2}{2} + C = \frac{1}{2} (\ln v)^2 + C$ **C)**

13)

$$u = \ln \sqrt{x} \quad du = \frac{1}{\sqrt{x}} \left(\frac{1}{2\sqrt{x}} \right) dx = \frac{1}{2x} dx \Rightarrow \frac{1}{x} dx = 2 du$$

$$2 \int u du = u^2 + C = (\ln \sqrt{x})^2 + C = (\ln x^{1/2}) (\ln x^{1/2}) = \frac{1}{4} (\ln x)^2 + C \quad \mathbf{E)}$$

14)

$$\frac{x^2}{x^2-1} = 1 + \frac{1}{x^2-1} \quad \int \left(1 + \frac{1}{x^2-1} \right) dx = x + \frac{1}{2} \int \left(\frac{1}{x-1} \right) dx - \frac{1}{2} \int \left(\frac{1}{x+1} \right) dx$$

$$x + \frac{1}{2} \ln|x-1| - \frac{1}{2} \ln|x+1| + C = x + \frac{1}{2} \ln \left| \frac{x-1}{x+1} \right| + C \quad \mathbf{A)}$$