Directions: This homework is designed to review prerequisite material. If you need to consult your calculus notes for a few of these problems, that is not a concern. However, if you are having significant difficulty, it indicates that you may not have achieved sufficient mastery of the prerequisite material for this course. See me for more information.

1. Differentiate the following.

   (a) $f(x) = \sqrt{x}\cos(3x)$

   (b) $f(x) = \left(\dfrac{\sin(x)}{\ln(x)}\right)^2$

   (c) $f(x) = 7^{\tan(x)} - \ln(x^3)$

   (d) $f(x) = \displaystyle\int_{14}^{x} \sin(x)\cos(x)\,dx$

2. Evaluate the following integrals. In parts (c) and (d), your solution to the indefinite integral should be the family of antiderivatives.

   (a) $\displaystyle\int_{0}^{1} 3x\sqrt{x^2+2}\,dx$

   (b) $\displaystyle\int_{0}^{\pi/4} \sec(x)\tan(x)\,dx$

   (c) $\displaystyle\int xe^x\,dx$

   (d) $\displaystyle\int \sqrt{2-x^2}\,dx$

3. Find integrals for the following quantities. *You do not need to actually solve these integrals.*

   (a) The volume of rotation *about the x-axis* of the region bounded by $g(x) = e^{-x}$ and the lines $y = 0$, $x = 0$, and $x = 1$.

   (b) The volume of rotation *about the y-axis* of the region bounded by $g(x) = e^{-x}$, and the lines $y = 0$, $x = 0$, and $x = 1$.

   (c) Which axis of rotation results in a larger volume? Justify your answer.

4. Find the Taylor series expansion of $f(x) = \sin(x)/x$ about $x = 0$. Give enough terms of the series so that the pattern is clear.