This test is a closed-book test; you are not allowed to use any calculators. Please write your name below. Be sure to look at all problems before deciding which to do first. Note that some problems are easier than others. You may use the backs of the pages if you need additional space. You have 50 minutes to work.

**Be sure to show your work.**

Name: _________________________________

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Instructor: Amos Ong  M T W F 8:00 AM – 8:50 AM

1. **[40 pts]** Let $A$ be the region bounded between and $y = 0$ and $y = x^2 + 4$, $x \in [1, 2]$.
   
   (a) Find the volume generated by revolving $A$ about the $y$-axis.
   
   (b) Find the moment of $A$ about the $y$-axis (assuming $\rho = $ constant).

2. **[20 pts]**

   Let $A$ be the region bounded between $y = \sqrt{x}, y = x^2$, Find the volume generated by revolving $A$ about the $x$-axis.

3. **[30 pts]** Find the surface area by revolving the graph of $y = x^3$ between $x = 16$ and $x = 20$ about the $x$-axis.

4. **[60 pts]** Evaluate the following indefinite integrals

   (a) $\int e^{2x} \cos x \, dx$
   
   (b) $\int 5x^4 \ln x \, dx$

   (c) $\int \cos 2x \sin 5x \, dx$

   (d) $\int \cos^2(5x) \, dx$

   (e) $\int \frac{x^3}{\sqrt{x^2 + 9}} \, dx$