This heart warming fifty-minute test covers chapter five of *Calculus* by Stewart. Clearly indicate your answers. Each of the following eight problems is worth ten points.

1. Find the area between the curves: $y = x^3$ and $x = y^3$.

2. Find the area between the curves: $x + y^2 = 2$ and $x + y = 0$.

3. The base of an object $S$ is the area between $y = x^2 - 4$ and the $x$-axis. Cross-sections perpendicular to the $x$-axis are squares.
   a. Set up an integral to evaluate the volume of the solid $S$.
   b. Evaluate the integral.
4. Find the volume of the solid obtained by rotating the region bounded by $y = x^2$ and $y = x^3$ about the $x$-axis.

5. Find the volume of the solid obtained by rotating the region bounded by $y = x^3$, $y = 8$ and $x = 0$ about the $y$-axis.

6. What is average value of the function $\sin^9(x)\cos(x)$ on the interval $[0, \pi/2]$. 
7. A 251 Newton force is require to stretch a spring from its natural length of 2 meters to 3 meters.
   
   a. Find the spring constant $k$.

   b. Find how much work is required to stretch the spring from 3 to 30 meters.

8. A large fish tank is 2 meters wide, 8 meters long, and 4 meters tall. The tank is full. How much work is required to pump out 1/2 of the water? (The density of water is 1000 kg/m$^3$ and the acceleration due to gravity is 9.8 meters/second.)