Answer all questions and show your work. Unsupported answers may receive *no credit*. You may not use a calculator on this quiz. Allow 15 minutes for the quiz.

Name: ——————————————————   Section: ——————————————————

1. (5 points) Let R be the region in the first quadrant bounded by the functions $y = x^2$, $y = 6 - x$, and $x = 0$ (the y-axis). Set up but *do not evaluate* the integral that calculates the volume of the solid obtained by rotating R about the y-axis using the Shell Method.

   Solution:

   The points of intersection are $x = -3$ and $x = 2$ obtained by solving $x^2 = 6 - x$ but only $x = 2$ is in the first quadrant. Since the regions is bounded by $y = x^2$, $y = 6 - x$ and $x = 0$, using the Shell Method,

   $$V = 2\pi \int_0^2 x(6 - x - x^2)dx$$

2. (5 points) Let S be a surface obtained by rotating $y = x^4$ from $(1, 1)$ to $(2, 16)$ around the x-axis. Set up but *do not evaluate* the integral that calculates the surface area of S.

   Solution:

   Note that for $y = f(x)$, the derivative is $y' = 4x^3$ then by the formula for the surface area of the revolution,

   $$V = 2\pi \int_1^2 x^4 \sqrt{1 + (4x^3)^2}\, dx$$