Read directions carefully and show all your work. Partial credit will be assigned based upon the correctness, completeness, and clarity of your answers.

1. (5 pts) Find the arc length of \( f(x) = 2x^{3/2} \) from \( x = 0 \) to \( x = 7 \).

   \[
   \text{Arc Length} = \int_{a}^{b} \sqrt{1 + \left( f'(x) \right)^2} \, dx
   \]

   \[
   f(x) = 2x^{3/2} \]
   \[
   f'(x) = 3x^{\frac{1}{2}} \Rightarrow \left[ f'(x) \right]^2 = (3\sqrt{x})^2 = 9x
   \]

   \[
   \int_{0}^{7} \sqrt{1 + 9x} \, dx
   \]

   \[
   = \left[ \frac{2}{3} \sqrt{9x} \right]_{0}^{7} = \frac{2}{3} \left[ (9 \cdot 7) - (9 \cdot 0) \right] = \frac{2}{3} \cdot 63 = 42
   \]

2. (5 pts) Consider the region bounded by \( y = x^2 \) and \( y = x + 2 \).

   (a) Shade the appropriate region on the graph below.

   (b) SET-UP, BUT DO NOT EVALUATE an integral expression that represents the volume of the solid created when this region is rotated around the line \( y = -1 \).

   Rotation around horizontal axis \( \Rightarrow \) vertical slices \( \Rightarrow \) integrate with respect to \( x \)

   Cross sections look like washers

   Outer Radius \( R = x + 2 - (-1) = x + 3 \)

   Inner Radius \( r = x^2 - (-1) = x^2 + 1 \)

   \[
   V = \int_{a}^{b} \pi (R^2 - r^2) \, dx = \int_{a}^{b} \pi \left[ (x + 3)^2 - (x^2 + 1)^2 \right] \, dx
   \]