1. Set up (but do not evaluate) the integral which when evaluated will equal the volume of the solid generated by rotating about the line \( x = -4 \) the region bounded by the parabola \( y = -(x - 5)(x + 1) = -x^2 + 4x + 5 \) and the \( x \) axis.

2. Set up (but do not evaluate) the integral which when evaluated will equal the volume of the solid generated by rotating about the line \( x = 6 \) the region bounded by the parabola \( y = 4x - x^2 \) and the \( x \) axis.

3. Given that \( f(x) = |x - 3| + x \), find \( F(x) \) such that \( F'(x) = f(x) \) for all \( x \) including \( x = 3 \).

4. A tank full of water has a cross section the shape of a trapezoid with a short side at the bottom and a long side at the top. The top is 35 feet long. The bottom is 15 feet long. The height is 24 feet. The tank is 20 feet long. Find the work done in pumping all of the water to a level 4 feet above the top of the tank.
Use a $u$-substitution to find the following antiderivatives.

1. $\int \frac{dx}{36 + 49x^2}$

2. $\int \frac{dx}{\sqrt{36 - 49x^2}}$

3. $\int \frac{xdx}{49x^2 + 36}$

4. $\int \frac{f'(x)dx}{5f(x) + 8}$

5. $\int \frac{f'(x)}{25 + 4[f(x)]^2} \, ds$

6. $\int \frac{f'(x)dx}{\sqrt{16 - [f(x)]^2}}$
1. Set up the integral which when evaluated will equal the volume of the solid generated by rotating about the line $y = -5$ the region bounded by the curve $y = -x^2 + 9x + 10$ and the $x$ axis.

2. Set up the integral which when evaluated will equal the volume of the solid generated by rotating about the line $y = 12$ the region bounded by the curve $y = 6x - x^3$ and the $x$ axis.

3. An aquarium is $3/2$ feet wide, 3 feet long, and 2 feet deep. Find the work required to pump the water out an outlet 3 feet above the top of the tank. Use weight density of water as 62.5 lb/ft$^3$. 
5834 The Hanging Chain

1. A chain weighs 3 lbs per foot. The chain runs over a pulley at the top of a castle with 80 feet of the chain hanging down by the castle wall. The castle wall is 100 feet above the ground. There is a bucket on the end of the chain containing boiling oil. As the chain rolls over the pulley oil leaks out of the bucket onto the heads of the attackers below. The oil leaks from the bucket at the rate of $5/4$ lbs for every foot the bucket is lifted. The bucket alone weighs 40 lbs. There is 150 lbs of oil in the bucket to start. Find the work required to lift the chain and the bucket over the pulley.

2. A uniform cable hangs over the edge of a very tall building and is 100 feet long. The total weight of the cable is 125 lbs. Attached to the cable is a large container of oil. The container weighs 40 lbs. At the start, the oil in the container weighs 500 lbs. As the container is lifted, oil leaks from the container at the rate of 4 lbs per foot. For every foot the container is lifted 4 lbs of oil leaks from the container. How much work is required to lift the cable, container, and oil for 80 feet to within 20 feet of the top of the building.