1. Find the volume of the solid obtained by rotating the region bounded by \( y = x^2 - 3x + 2 \), \( y = 0 \); about the y-axis.

2. Suppose that 2 J of work are needed to stretch a spring from its natural length of 30 cm to a length of 42 cm. How much work is needed to stretch it from 35 cm to 40 cm?

3. Find the average value of the function \( f(x) = \sin^2(x)\cos(x) \) on the interval \([-\pi/2, \pi/4]\).

4. Find the volume of the solid obtained by rotating the region bounded by \( y = x\sqrt{x^3 + 1} \), \( y = 0 \), \( x = 0 \), \( x = 2 \); about the y-axis.

5. An aquarium 2 m long, 1 m wide, and 1 m deep is full of water. Find the work needed to pump half of the water out of the aquarium.

6. Find the average value \( f_{avg} \) of the function \( f(x) = 4x - x^2 \) on the interval \([0, 3]\) and determine the value \( c \) on \([0, 3]\) such that \( f_{avg} = f(c) \).

7. Find the volume of the solid obtained by rotating the region bounded by \( y = x^2 \), \( y = 0 \), \( x = 1 \), \( x = 2 \), about \( x = 4 \).

8. A circular swimming pool has a diameter of 24 ft, the sides are 5 ft high, and the depth of the water is 4 ft. How much work is required to pump all the water over the side?

9. If \( f \) is continuous on \([1, 3]\) and \( \int_1^3 f(x)dx = 8 \), show that \( f \) takes on the value 4 at least once on the interval \([1, 3]\).

10. Find the volume of the solid obtained by rotating the region bounded by \( y^2 - 6y + x = 0 \), \( x = 0 \); about the x-axis.

11. A cable that weighs 2 lb/ft is used to lift 800 lb of coal up a mineshaft 500 ft deep. Find the work done.

12. Find the number \( b \) such that the average value of \( f(x) = 2 + 6x - 3x^2 \) on the interval \([0, b]\) is equal to 3.

13. Find the volume of the solid obtained by rotating the region bounded by \( y = \frac{1}{\sqrt{1+x}} \), \( y = 0 \), \( x = 0 \), \( x = 3 \), about the y-axis.

14. A bucket that weighs 4 lb and a rope of negligible weight are used to draw water from a well that is 80 ft deep. The bucket starts with 40 lb of water and is pulled up at a rate of 2 ft/s but water leaks out of a hole at a rate of 0.2 lb/s. Find the work done in pulling the bucket to the top of the well.

15. Suppose the average value of a function \( f \) on the interval \([0, t]\) is \( \tan(t) + t^2 \). Find the function \( f(t) \).

16. A tank, shown below, is full of water. Find the work required to pump the water out of the outlet.
17. A tank, shown below, is full of water. Find the work required to pump the water out of the outlet. (Use the fact that water weighs 62.5 lb/ft³).