1. Find the area of the region bounded by the curves.
   \[ y = x^2 - 2x, \quad y = x + 4 \]

2. Find the area of the region bounded by the curves.
   \[ y = x + 2, \quad y = 16 - x^2, \quad x = -2, \quad x = 2 \]

3. Find the area of the region bounded by the curves.
   \[ y = \cos x, \quad y = \sin 2x, \quad x = 0, \quad x = \frac{\pi}{2} \]

4. Find the volume of the solid obtained by rotating the region in the first quadrant bounded by \( y = x^2 \) and \( y = 9 \) about the y-axis.
5. Use calculus to find the area of the triangle with given vertices. 
(0,0), (2,1), (-1,6)

6. Find the volume of the solid obtained by rotating the region bounded in the first quadrant by $y = x^3$ and $x = y^3$ about the x-axis.

7. Find the volume of the solid obtained by rotating the region bounded by $x = y^2$ and $x = 3y$ about the y-axis.

8. Find the number $b$ such that the line $y = b$ divides the region bounded by the curves $y = x^2$ and $y = 4$ into two regions with equal area.
9. Find the number(s) \( a \) such that the average value of the function 
\[ f(x) = 80 - 34x + 3x^2 \] on the interval \([0, a]\) is equal to 10.

10. Find the volume of the solid obtained by rotating the region bounded by \( y = 2x \) and 
\( y = x^2 \) about the x-axis.

11. Find the volume of the solid obtained by rotating the region bounded by 
\( y = x^2 \), \( y = 0 \), \( x = 1 \), and \( x = 8 \) about \( x = 1 \).

12. Find the volume of the solid obtained by rotating the region bounded by 
\( y = x^2 + 3x - 10 \) about the x-axis.
13. The height of a monument is 20 meters. A horizontal cross-section at a distance $x$ meters from the top is an equilateral triangle with side $\frac{x}{4}$ meters. Find the volume of the monument.

14. Find the volume of the solid obtained by rotating the region bounded by $x^2 + (y - 1)^2 = 1$ about the y-axis.

15. If 132 J of work are needed to stretch a spring from 9 cm to 12 cm and another 588 J are needed to stretch it from 12 cm to 19 cm, what is the natural length of the spring?

16. A heavy rope, 40 ft long, weighs 0.8 lb/ft and hangs over the edge of a building 110 ft high. How much work is done in pulling the rope to the top of the building?
17. A tank is full of water. The tank is a right circular cylinder lying on its side (length is parallel to horizon), with radius 2 m, and length 5 m. Find the work required to pump the water out of a spout that rises 2 m above the tank. Set up the integral, but do NOT evaluate. (Hint: let x = 0 be the center of the radius.)

18. The base of a solid is a circular disk with radius 3. Find the volume of the solid if parallel cross-sections perpendicular to the base are isosceles right triangles with hypotenuse lying along the base.

19. Find the average value of the function \( z(t) = 4t \sin^2 t \) on the interval \([0, \sqrt{\pi}]\).

20. The temperature of a medal rod, 4 m long, is \( 3x \) (in degrees Celsius) at a distance \( x \) meters from one end of the rod. What is the average temperature of the rod?