1. Evaluate
   (a) \[8\%\] \(\int_0^4 |2x - 1| \, dx\)
   (b) \[8\%\] \(\int_0^1 x(x + 1)^{10} \, dx\)
   (c) \[8\%\] \(\int_0^1 (x + 3) \sqrt{2 - x} \, dx\)
   (d) \[8\%\] \(\int_0^1 \frac{e^{2x}}{e^{2x} + 1} \, dx\)

2. \[8\%\] Find the derivative of \(y = (x^2 + 1)^{x^2} - 2\).

3. \[8\%\] A company purchases a new machine for which the rate of depreciation can be modelled by
   \[
   \frac{dV}{dt} = 10,000(t - 6), \quad 0 \leq t \leq 5
   \]
   where \(V\) is the value of the machine after \(t\) years. Set up and evaluate the definite integral that yields the total loss of value of the machine over the first 5 years.

4. The marginal revenue for the sale of a product can be modelled by \(\frac{dR}{dx} = 50 - 0.02x + \frac{100}{x + 1}\), where \(x\) is the quantity demanded.
   (1) \[6\%\] Find the revenue function \(R\).
   (2) \[4\%\] Find the revenue when 1500 units are sold.

5. Find the volume of the solid obtained by revolving the curve \(y = \frac{x^2}{3}\) from \((0, 0)\) to \((1, \frac{1}{3})\)
   (a) \[6\%\] about x-axis.
   (b) \[6\%\] about the line \(y = -3\).

6. \[10\%\] Use the Midpoint Rule with \(n = 4\) to approximate \(\int_0^2 \frac{5}{x^2 + 1} \, dx\).

7. \[10\%\] Find the area of the region bounded by the graphs of \(f(x) = (x - 1)^3\), and \(g(x) = x - 1\) from \(x = 0\) to \(x = 2\).

8. \[10\%\] The demand and supply functions for a product are
   Demand: \(p = -0.2x + 12\) and Supply: \(p = 0.3x + 2\)
   where \(x\) is the number of units (in millions). Find the consumer and producer surpluses for this product.

   Hint: Let \((x_0, p_0)\) be the point at which a demand function and a supply function intersect. Economists call the area of the region bounded by the graph of the demand function, the horizontal line \(p = p_0\), and the vertical line \(x = 0\) the consumer surplus. Similarly, the area of the region bounded by the graph of the supply function, the horizontal line \(p = p_0\), and the vertical line \(x = 0\) is called the producer surplus.