

1. Let $f(x) = (x^2 - 1)^3$. Find the absolute maximum and minimum of f on the interval $[-1, 2]$.
2. Let $f(x) = -x^3 + 3x^2 + 2$.
 - (a) Find the intervals on which f is increasing or decreasing.
 - (b) Find the intervals of concavity and the inflection points.
 - (c) Sketch the graph of f .
3. A rectangular storage container with an open top is to have a volume of 20 m^3 . The length of its base is twice the width. Material for the base costs \$5 per square meter. Material for the sides costs \$9 per square meter. Find the cost of materials for the cheapest such container.
4. A particle is moving along a straight line with the given data. Find the position function $s(t)$.

$$a(t) = 20t^3 - 12t, \quad s(1) = 0, \quad v(1) = 0.$$

5. Evaluate the integral.

(a) $\int_0^1 (1 + x^2)^2 dx$

(b) $\int_1^4 \frac{3y - 2}{\sqrt{y}} dy$

(c) $\int_0^{2\pi} (1 - \sin^2 \theta) \cos \theta d\theta$

(d) $\int te^{-t^2} dt$

(e) $\int \frac{1}{s \ln s} ds$