1. Let $f(x) = (x^2 - 1)^3$. Find the absolute maximum and absolute minimum values 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 with the given data. Find the position function $s(t)$ of the particle.

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

5. Evaluate the integral.

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

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

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

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

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

6. Differentiate the function.

(a) $f(x) = (x \ln x) - x$

(b) $f(x) = (x - 1)e^x$