1. Find the absolute max and absolute min of \( f(x) = x^3 - 3x^2 \) on the interval \([-2, 3]\).

2. Does \( f(x) = \frac{e^x}{x^2} \) have an absolute max or an absolute min on the given interval? If so, find it.
   a) \([-1, 1]\)    b) \([1, 3]\)    c) \((0, \infty)\)

3. Assuming \( f'' \) is continuous, what can be concluded about \( f \) at each \( x \)-value?

\[
\begin{array}{c|cccc}
 x & -1 & 0 & 1 & 2 & 3 \\
 f'(x) & 2 & 3 & 0 & 0 & 0 \\
 f''(x) & 0 & -1 & 1 & 0 & -2 \\
\end{array}
\]

4. Stewart 4.6.14 A storage box with an open top is to have a volume of 10 cubic meters. The length of the base is twice the width. Material for the base costs $10 per sq.m and material for the sides costs $6 per sq.m Find the dimensions for the cheapest such box.

5. Write out but do not compute the left and right hand Riemann sums for
   a) \( f(x) = e^x \) on \([0, 2]\) with \( n = 5 \).
   b) \( f(x) = 4^x - 4x^2 \) on \([0, 2]\) \( n = 4 \) Sketch the rectangles.

6. Evaluate using geometry or symmetry.
   a) \( \int_{-2}^{3} x \, dx \)
   b) \( \int_{-30}^{30} (x^9 + 2x^7 - 3x^5 + 14x) \, dx \)
   c) \( \int_{0}^{3} \left( \sqrt{9-x^2} - 4(x-3) \right) \, dx \)

7. The velocity of an object moving back and forth on a straight path is
   \( v(t) = 20 - 5t^2 \) m/s. The position at \( t=0 \) is \( s(0)=0 \).
   a) Find the position at \( t=3 \).
   b) Find the total distance traveled in the first 3 seconds.

8. Find the function, \( f(t) \), for which
   a) \( f''(t) = 8e^{2t} \quad f'(0) = -6 \quad f(0) = 3 \)
   b) \( f''(x) = 6x + 2 \quad f(1) = 4 \quad f(2) = 24 \)
9. Evaluate each definite integral.

a) \[ \int_{-1}^{4} \frac{x + 2}{\sqrt{x + 5}} \, dx \]

b) \[ \int_{0}^{\ln 6} e^x (e^x + 3)^2 \, dx \]

10. Find each antiderivative.

a) \[ \int \frac{1}{x^{2/3}} \, dx \]

b) \[ \int (6e^t + 4 \sin t) \, dt \]

c) \[ \int \frac{x^3 - 2x}{\sqrt{x}} \, dx \]

d) \[ \int 3 \sec^2 t \, dt \]

e) \[ \int \tan^2 t \sec^2 t \, dt \]

f) \[ \int \sin^3 t \cos t \, dt \]

g) \[ \int x(x^2 - 1)^8 \, dx \]

h) \[ \int x^3(x^2 - 1)^8 \, dx \]

i) \[ \int e^x(3e^x + 1)^{1/2} \, dx \]

j) \[ \int \frac{\ln x}{x} \, dx \]

k) \[ \int \frac{1}{x(\ln x)^2} \, dx \]

11. Simplify each to a function of \( x \) without derivatives or integrals.

a) \[ \frac{d}{dx} \left( \int_{1}^{x} \sin^3 t \, dt \right) \]

b) \[ \int_{1}^{x} \frac{d}{dt}(\sin^3 t) \, dt \]