MATHEMATICS 141 WORKSHEET 8

Show all work for full credit.

1. A box with a square base and open top must have a volume of 32,000 cm³. Find the dimensions of the box that minimize the amount of material used. Prove your answer.

2. If 1200 cm² of material is available to make a box with a square base and open top, find the largest possible volume of the box. Prove your answer.
3. The top and bottom margins of a poster are 6 cm and the side margins are each 4 cm. If the area of printed material on the poster is fixed at 384 cm², find the dimensions of the poster with the smallest area.
4. Evaluate the integral.

\[ \int (3x^2 + 4)(x^3 + 5x) \, dx \]

5. Evaluate the integral.

\[ \int \frac{3x + 6}{x^2 + 4x + 5} \, dx \]

6. Evaluate the integral.

\[ \int \frac{2x^4 + 1}{\sqrt{2x^4 + 5x + 1}} \, dx \]

7. Evaluate the integral.

\[ \int x^2 \sin(x^3) \cos(x^3) \, dx \]
8. Evaluate the integral.
\[ \int x \sec(x^2 + 4) \tan(x^2 + 4) \, dx \]

9. Evaluate the integral.
\[ \int \frac{\cos x}{1 + \sin^2 x} \, dx \]

10. Evaluate the integral.
\[ \int \frac{\cos x}{(1 + \sin x)^2} \, dx \]