HOMEWORK 7 - MATH 151
DUE DATE: Thursday, April 5
INSTRUCTOR: George Voutsadakis

Read each problem **very carefully** before starting to solve it. Four out of the ten problems will be chosen at random and graded. Each problem graded is worth 3 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. A box with a square base and open top must have a volume of 32,000 cubic centimeters. Find the dimensions of the box that minimize the amount of material used.
2. A rectangular storage container with an open top is to have a volume of 10 cubic meters. The length of its base is twice the width. Material for the base costs $ 10 per square meter and material for the sides costs $ 6 per square meter. Find the cost of materials for the cheapest such container.
3. Find the points on the ellipse $4x^2 + y^2 = 4$ that are farthest away from the point $(1, 0)$.
4. A fence 8 feet tall runs parallel to a tall building at a distance of 4 feet from the building. What is the length of the shortest ladder that will reach from the ground over the fence to the wall of the building?
5. Use Newton's method with initial approximation $x_1 = 1$ to find the third approximation x_3 to the root of the equation $x^3 + 2x - 4 = 0$.
6. Use Newton's method to approximate the positive root of $2\cos x = x^4$ correct to six decimal places.
7. Find the most general antiderivative of the functions
   (a) $f(x) = 1 - x^3 + 12x^5$
   (b) $f(x) = \sqrt[3]{x} + \frac{5}{x^6}$
   (c) $f(x) = 3e^x + 7\sec^2 x$
8. Find f if
   (a) $f'(x) = \sqrt{x}(6 + 5x), f(1) = 10$
   (b) $f'(x) = \cos x + \sec^2 x, -\frac{\pi}{2} < x < \frac{\pi}{2}, f(\frac{\pi}{3}) = 4$
   (c) $f''(x) = \frac{3}{\sqrt{x}}, f(4) = 20, f'(4) = 7$
9. Find a function f such that $f'(x) = x^3$ and the line $x + y = 0$ is tangent to the graph of f.
10. A particle is moving with the given data. Find the position of the particle:
    (a) $v(t) = \frac{3}{2}\sqrt{t}$, $s(4) = 10$.
    (b) $\alpha(t) = 10\sin t + 3\cos t, s(0) = 0, s(2\pi) = 12$.