1. Do not try this exam until you are ready to sit down for 50 consecutive minutes to work all the problems, undisturbed by anything or anyone.

2. Do all the following problems as if you are taking a real exam. Show all your work and write things clearly and neatly and indicate your final answer.

3. As in the real exam, you are not allowed to use books, notes or calculators.

4. This set of review problems is not intended to be a perfect indication of what topics will or will not actually appear on the real midterm exam. For example, you may perhaps notice that some topics we have covered in the course are not stressed in this set of review problems; but that does not mean they will be equally ignored on the actual midterm. As usual, you are responsible for all that is done in the course, i.e. in the lecture, textbook, homework and WebWork.

5. Try to do these problems before the Review Session on Friday. We will discuss the solutions and answer your other questions then.
1. Evaluate the integrals (a) \( \int_{1}^{4} (\sqrt{x} - \frac{1}{x})^2 \, dx \) (b) \( \int_{4}^{0} \frac{x}{\sqrt{9 + x^2}} \, dx \).

2. Compute the integral \( \int (2 \sin(3x) - x^2 \sec^2 x^3) \, dx \).

3. Find the area bounded between the graph of the function \( f(x) = x^3 - 12x \) and the straight line \( y = -3x \).

4. The speed of a particle is \( v(t) = 80t^3 - 30t^2 \) meter/sec. What is the average speed of this particle over the interval of time \([1, 4]\)?

5. Find the critical points of the function

\[
f(x) = \int_{0}^{2x^3-3x^2} (1 + \sin x)^{2010} \, dx.
\]

6. Find the derivative of the function \( F(x) = \int_{x^3}^{\sin x} (\cos t)^{17} dt \).

7. Compute the volume of the solid body generated by revolving the region enclosed between the graph of the function \( f(x) = 1 - x^2 \) and the \( x \)-axis about the straight line \( y = 4 \).

8. Suppose that \( f^{-1}(x) \) is the inverse of a differentiable function and let \( G(x) = \sin(f^{-1}(x)) \). If \( f(\pi) = 3 \) and \( f'(\pi) = 7 \), find \( G(3) \) and \( G'(3) \).