EXAM 2 - MATH 152

DATE: Tuesday, October 19 INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. Each question is worth 3 points. It is necessary to show your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

- 1. A 3-lb bucket containing 20 lb of water is hanging at the end of a 20 feet rope that weighs 0.25 lb/ft. The other end of the rope is attached to a pulley. How much work is required to wind the length of rope onto the pulley, assuming that the rope is wound onto the pulley at a rate of 2ft/sec and that as the bucket is being lifted, water leaks from the bucket at a rate of 0.5 lb/sec?
- 2. An observation window on a submarine is a square with 2 feet sides. Using ρ_0 for the weight density of seawater, show that, if the submarine descends vertically at a constant rate r, then the fluid force on the window increases at a constant rate.
- 3. Show that $\cosh^{-1} x = \ln (x + \sqrt{x^2 1}), x \ge 1$. Then use the formula to obtain a formula for the derivative of $\cosh^{-1} x$.
- 4. Compute the integrals
 - (a) $\int x^7 \ln x dx$
 - (b) $\int \tan^{-1} x dx$
- 5. Compute the integrals
 - (a) $\int \sin^3 (2x) \cos^2 (2x) dx$
 - (b) $\int \tan{(5x)} dx$
- 6. Compute the integral $\int \frac{2x^2+3}{x(x-1)^2} dx$.