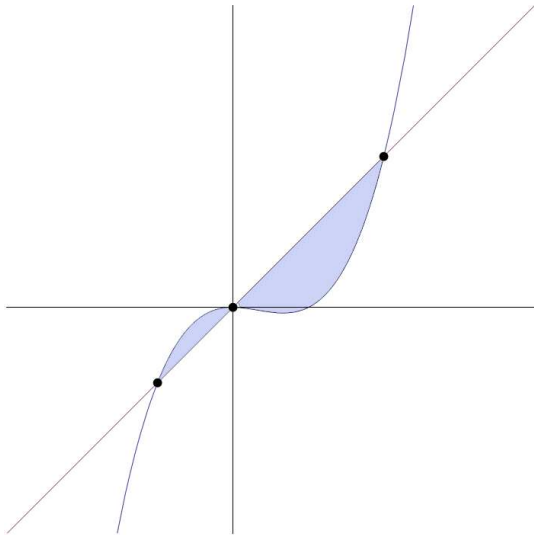YOUR NAME:_____   George Voutsadakis

Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. Find the area of the region enclosed by the graphs of the functions $f(x) = x^3 - x^2$ and $g(x) = 2x$.

2. Integrate by parts to evaluate $\int xe^{3x}dx$.

3. Contamination is leaking from a waste disposal tank at the rate of $t \ln t$ thousand gallons per month, where t is the number of months since the leak began. Find the total leakage from the end of month 1 to the end of month 4.

4. Compute the improper integral $\displaystyle\int_e^\infty (\ln x)^{-2}\frac{1}{x}dx$.

5. Solve the initial value problem

$$y' = x^4 y + \frac{5x^4}{y}, \quad y(0) = 2.$$