You have 50 minutes to complete this test. You must *show all work* to receive full credit. Work any 6 of the following 7 problems. Clearly **CROSS OUT** the problem you do not wish me to grade. Each problem is worth 16 points, and you get 4 points for free, for a total of 100 points. The answers will be posted on the electronic reserves tomorrow.

1.   Solve $y' = 8x^3 e^{-2y}$ if $y = 0$ when $x = 1$.

2.   Find $f'(x)$ for the following functions. DO NOT simplify!

    (a) $f(x) = \ln(8x + 5)^2$

    (b) $f(x) = \dfrac{e^x + e^{-x}}{x^2}$

3.   a)   How long will it take for \$2000 to grow to \$5000 if the investment earns interest at an annual rate of 8% compounded continuously?

b)   What quarterly interest rate would be required in order to accomplish the same goal in the same amount of time?

4.   a)   Solve for x: $\log_3(2x+3) = 4 - \log_3(x+6)$.

b)   Solve for x: $6e^{1-x} + 1 = 25$.

5.   For the function $f(x) = 1 + \ln(x^2)$, list all intervals of increase and decrease, all maximum and minimum *points*, intervals where the function is concave up and concave down, all inflection *points*, and all asymptotes (or say there are none). Then sketch the graph of the function, being sure to label appropriately.

6. Evaluate the following integrals:

a) $\int x^3 \left(x^2 - 1\right)^8 dx$

b) $\int \left(x^{\frac{2}{3}} - \frac{1}{x} + 5 + \sqrt{x} \right) dx$

7. Solve $\int x e^{-\frac{x}{2}} dx$