MCS 119
Calculus with exponential functions

1. Compute the derivatives of the following functions.

   (a) $y = e^{-x}$

   (b) $y = e^{\sqrt{x}}$

   (c) $y = e^x x^e$

   (d) $y = e^{(x^2+1)/(3x-1)}$

   (e) $y = \dfrac{e^{2x} + 1}{e^x - 1}$

   (f) $y = (e^{x^3 - 2x + 1} + x^2 - 1)^3$

   (g) $y = e^3$

   (h) $y = (e^{x^2 + 1})^4$

2. Evaluate the following integrals.

(a) $y = \int_0^2 e^{-x} dx$

(b) $y = \int x^2 e^{x^3} dx$

(c) $y = \int e^x e^{e^x} dx$

(d) $y = \int (e^x + 1)(e^x + x)^4 dx$

3. Find the critical points of $f(x) = e^{x^3 - 3x}$ and classify them as local max, local min, or neither.

4. Find the area bounded by the graph of $y = xe^{-x^2}$ and the x-axis from $x = 0$ to $x = 4$.

5. Is the graph of $y = e^{-x^2}$ concave up or concave down at $x = 0$? What about at $x = 5$?

6. Use implicit differentiation to compute dy/dx if $xe^x - e^y = 0$.

7. If I deposit \$1000 in the bank earning 3 percent interest compounded continously then the amount of money I have in year t is given by $A = 1000e^{.03t}$ At what rate (in dollars per year) is my investment increasing when $t = 10$?