

Differential Equations requires *proficiency* in calculus. Work these problems as soon as possible. The purpose is to help you identify types of problems that you need to review immediately.

Show all steps. Do not present solutions on this page. If you have difficulty working a problem, you should review that type of problem in your calculus text. Read "Grading and Writing" in the class policy before beginning this assignment.

1. Simplify the following wherever possible:

(a) $\ln x^2 - \ln \sqrt{x} + 3 \ln x$

(b) $\frac{e^{-x} e^{7x}}{e^{3x}}$

(c) $\frac{\ln x}{\ln x^2}$

(d) $e^{-\ln x^3}$

2. Determine first derivatives of the following:

(a) $y = \cos^4 x$

(b) $f(x) = \sqrt{x^6 - 3}$

(c) $z = \ln x^4$

(d) $h(x) = \cos(x^2)$

(e) $y = \frac{x^4}{x^2 - 5}$

(f) $w = e^{-2x} \cos 3x$

3. Determine the following integrals by hand using methods learned in Calc II. Show all steps; do not use integral tables.

(a) $\int \sin^2 x \, dx$

(b) $\int \frac{x}{x+1} \, dx$

(c) $\int \frac{e^{-x}}{e^{-x} - 1} \, dx$

(d) $\int \frac{e^{-3x} + e^{4x}}{e^{2x}} \, dx$

(e) $\int x \sqrt{3 - x^2} \, dx$

(f) $\int \frac{4}{x^2 - 2x - 3} \, dx$ (use partial fraction decomposition)

(g) $\int \frac{x+6}{x^3 - 3x^2} \, dx$ (use partial fraction decomposition)

(h) $\int x e^{2x} \, dx$