

Differential Equations – Prerequisite Review

These problems are to be included in your *Homework Notebook*. Since these are review problems, no class time will be used for questions, however any questions can be asked during office hours.

A. Evaluate the following integrals, without using integral tables:

1. $\int e^{\frac{x}{2}} dx$

2. $\int \frac{1 + \sin x}{\cos x} dx$

3. $\int x^2 \ln x dx$

4. $\int x^2 \cos x dx$

5. $\int x^4 e^{2x} dx$

6. $\int \arctan x dx$

7. $\int \frac{1}{x^2 \sqrt{9 - x^2}} dx$

8. $\int \frac{1}{\sqrt{4x^2 + 1}} dx$

9. $\int \frac{\sqrt{x^2 - 9}}{x} dx$

10. $\int \frac{x^2 - 1}{x^3 + x} dx$

B. Given the following *implicitly defined functions*, find dy/dx :

11. $3x^2y - y^3 = 7$

12. $\cos 2y - x^4 = \tan x$

13. $e^{xy} + \ln y = 4$

14. $\frac{2x}{y} + 3x = y$

C. Given the following functions, $z = f(x, y)$, find both first partial derivatives:

15. $z = x^2 - 2xy + y^2$

16. $z = \ln \frac{x+y}{x-y}$

D. Other problems:

17. Given $f(x) = x^3 + 4x^2 - 5x + 12$, find $f'(x)$ where $f(0) = -8$

18. For the function, $f(x, y) = \sin xy$ show, in detail, that $f_{xy}(x, y) = f_{yx}(x, y)$