Midterm 2 Review

MATH 16B Spring 2016

Solutions will be provided for the following problems

Exercise 1. Compute

$$\int_0^{\sqrt{\pi}} x\sin(x^2)dx \qquad \text{and} \qquad \int_0^{\pi} x^2\sin x\,dx.$$

Exercise 2. Find all solutions to the differential equation

$$y' = -(y+1)^2(t+1)$$

(including possibly constant solutions).

Exercise 3. Compute

$$\int (\ln x)^2 dx.$$

Exercise 4. Compute

$$\int x(3x^2+1)^5 dx.$$

Exercise 5. Solve the following initial value problem.

$$y' + 2y\cos(2t) = 2\cos 2t, \quad y(\pi/2) = 0.$$

Exercise 6. Compute

$$\int \tan 2x\,dx.$$

Exercise 7. Compute

$$\int_{-\infty}^{0} e^{4x} dx.$$

Exercise 8. Solve the following initial value problem.

$$y' + 2y = 1, \quad y(0) = 1.$$

Exercise 9. Compute

$$\int_0^{\infty} xe^{-x^2} dx.$$

Exercise 10. Solve the following initial value problem.

$$y' = \frac{\ln x}{\sqrt{xy}}, \quad y(1) = 4.$$

Solutions will not be posted for the following problems

Exercise 11. Compute

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

Exercise 12. Compute

$$\int (x^3-6x)^7(x^2-2)dx.$$

Exercise 13. Compute

$$\int 3x^2 e^{x^3-1}dx.$$

Exercise 14. Compute

$$\int_0^{\pi} e^{\sin x}\cos x\, dx.$$

Exercise 15. Compute

$$\int_0^{\infty} \frac{x}{x^2+1}dx.$$

Exercise 16. Compute

$$\int_e^{\infty} \frac{10}{x(\ln x)^{11}}dx.$$

Exercise 17. Compute

$$\int x^2 - x\sin(2x)\, dx.$$

Exercise 18. Compute

$$\int \frac{x}{\sqrt{3+2x}}dx.$$

Exercise 19. Compute

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

Exercise 20. Compute

$$\int \frac{\ln(\ln x)}{x}dx.$$

Exercise 21. Compute

$$\int x\sqrt{2-x}dx.$$

Exercise 22. Compute

$$\int_2^{\infty} xe^{2-x}dx.$$

Exercise 23. Solve the following differential equation.

$$y' = e^{4y}t^3 - e^{4y}.$$

Exercise 24. Solve the following differential equation.

$$(1+t^2)y' = ty^2.$$

Exercise 25. Solve the following differential equation.

$$yy' = t\sin(t^2+1).$$

Exercise 26. Solve the following initial value problem.

$$3y^2y' = -\sin t, \quad y(\pi/2) = 1.$$

Exercise 27. Solve the following initial value problem.

$$y' = \frac{t^2}{y}, \quad y(0) = -5.$$

Exercise 28. Solve the following initial value problem.

$$y' = \frac{t+1}{ty}, \quad y(1) = -3.$$

Exercise 29. Solve the following differential equation.

$$y' - 2ty = -4t.$$

Exercise 30. Solve the following differential equation.

$$y' + y = 2 - e^t.$$

Exercise 31. Solve the following differential equation.

$$\frac{1}{\sqrt{t+1}}y' + y = 1.$$

Exercise 32. Solve the following initial value problem.

$$y' + \frac{y}{1+t} = 20, \quad y(0) = 10.$$

Exercise 33. Solve the following initial value problem.

$$ty' + y = \sin t, \quad y(\pi/2) = 0.$$

Exercise 34. Solve the following initial value problem.

$$y' = 2(10 - y), \quad y(0) = 1.$$