Math 104-004, Homework 2

Due in recitation on Monday Feb. 4 and Wednesday Feb. 6

Please show work, print this sheet, and attach it to the solutions.

Name: ____

Reading Thomas §(pages)

Problems

1 Spring 2008-5 Compute $\lim_{x\to 0} \dfrac{x}{\sin x + \tan x}$.

(a) -2 (b) 0 (c) $\frac{-1}{2}$ (d) $\frac{1}{4}$ (e) $\frac{1}{2}$

2 Spring 2008-3 Compute $f'(1)$ if $f(x) = e^{-x^2}$.

(a) e (b) 1 (c) $-2e^{-1}$ (d) $2e$ (e) does not exist

3 Show that each function $y(x)$ is a solution of the given differential equation

1. $y' = y^2$ and the solutions $y = -\frac{1}{x}$ and $y = -\frac{1}{x+C}$
2. $y(x) = \frac{\cos x}{x}$ is a solution of $xy' + y = -\sin x$, $x > 0$ with the initial condition $y(\frac{\pi}{2}) = 0$

4 Fall 2009-5 Which of the following functions solves the differential equation $y' = 4xy$?

(a) $y = e^{-4x}$ (b) $y = 4x$ (c) $y = e^{2x^2}$ (d) $y = e^{2x}$ (e) $y = 2x^2$ (f) $y = xe^{4x}$

5 Spring 2008-25 Let $f(x) = \frac{\ln x}{x}$. Over which of the following open intervals is f always decreasing.

(a) $(0, \frac{1}{e})$ (b) (e, ∞) (c) $(0, 1)$ (d) $(0, 2)$ (e) $(\frac{1}{e}, \infty)$

6 Spring 2011-20 A certain population grows according to the differential equation

$$\frac{dP}{dt} = \frac{P}{20}(1 - \frac{P}{4000})$$

and the initial condition $P(0) = 1000$. What is the size of the population at time $t = 100$.

(a) 1751 (b) $100+20/e$ (c) $4000e^{\frac{1}{20}}$ (d) $1000+200e^{\frac{1}{20}}$ (e) $\frac{4000}{(1+3e^{-\frac{1}{2}})}$ (f) $\frac{1000}{1+20e^{-10}}$

7 Fall 2010-8 Find the solution to the initial-value problem

$$\begin{aligned} \frac{dy}{dx} &= \frac{e^{-\sqrt{x}}}{y^2\sqrt{x}} \\ y(0) &= 3. \end{aligned}$$

(A) $y = (33 - 6e^{-\sqrt{x}})^{\frac{1}{3}}$ (B) $y = (45 - 18e^{-\sqrt{x}})^{\frac{1}{3}}$
(C) $y = (9 + 18e^{-\sqrt{x}})^{\frac{1}{3}}$ (D) $y = (30 - 3e^{-\sqrt{x}})^{\frac{1}{3}}$
(E) $y = \frac{3}{(2-e^{-\sqrt{x}})^{\frac{1}{3}}}$ (F) $y = \frac{9}{(45-18e^{-\sqrt{x}})^{\frac{1}{3}}}$
(G) $y = \frac{9}{(9+18e^{-\sqrt{x}})^{\frac{1}{3}}}$ (H) $y = \frac{3}{(9-8e^{-\sqrt{x}})^{\frac{1}{3}}}$

8 Fall 2009-15 Solve $y' = \frac{\ln x}{xy}$ with initial condition $y(1) = 2$.

9 Fall 2008-1 Solve the initial-value problem then use your solution to compute $x(3)$.

$$\frac{dx}{dt} + 2tx = x, \;\; x(0) = 5.$$

(a) $5e^{-6}$ (b) $5e^{6}$ (c) $6e^{5}$ (d) 3 (e) -10

10 Fall 2008-15 Solve the differential equation $7yy' = 5x$

(a) $7x^2 - 5y^2 = C$ (b) $5x^2 + 7y^2 = C$ (c) $5x^2 - 7y^2 = C$
(d) $7x^2 + 5y^2 = C$ (e) $5x^2 + 7y^2 = 12$