

Math 252 – Test 2: Version B

March 6, 2020

Name: _____

Instructor: Patricia Wrean

Total: 25 points

1. (4 points) Find a second solution to the following DE, given that $y_1 = x \cos x$ is a solution.

$$x^2 y'' - 2xy' + (x^2 + 2)y = 0$$

2. (6 points) Consider the following DE.

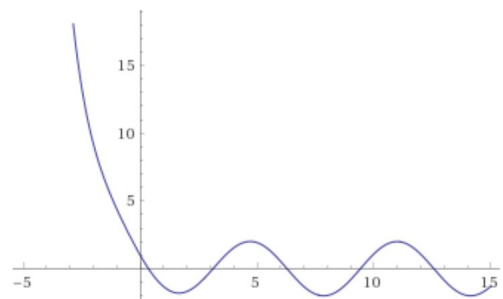
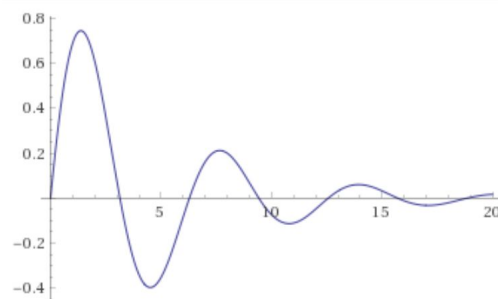
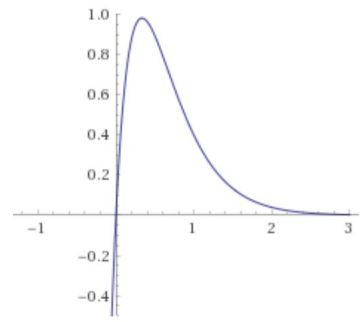
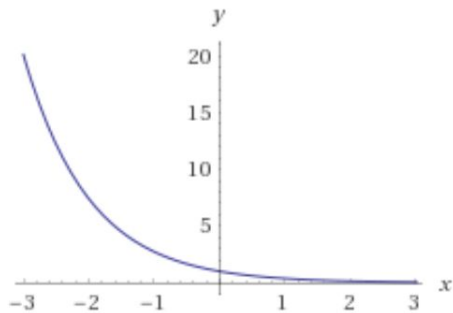
$$y'' + 6y' + cy = 0$$

(a) Solve this DE for the following values of c . Give exact answers.

(i) $c = 10$

(ii) $c = 9$

(b) For each of the solutions above, indicate which plot or plots below are possible graphs of that solution. No explanation is required. You may pick more than one.



3. (6 points) Use the method of variation of parameters to solve the following DE.

$$x^2y'' - 2xy' + 2y = x^5$$

4. (3 points) State the form of the particular solution y_p for the following. Leave your answer with undetermined coefficients. Please note that the complementary solution for the homogeneous equation is $y_c = C_1 + C_2e^{6x}$.

(i) $y'' - 6y' = -2e^{3x}$

(ii) $y'' - 6y' = 5x^2$

(iii) $y'' - 6y' = -3e^{6x} + \cos 2x$

5. (6 points) A mass of 0.4 kg is attached to a spring with constant 3.6 N/m. You may assume that there is no damping. The mass is released at 0.5 m above equilibrium with an downward velocity of 0.9 m/s.

(a) Find the position $y(t)$ of the mass as a function of time.

- (b) Give the amplitude and period of this motion. You do not need to calculate the phase shift.

amplitude: _____

period: _____