

Math 122  
Quiz 6 Review

Solve the following differential equations:

1.  $y'' - 3y' + 2y = 0$

4.  $y'' - 8y' + 16y = 0$

7.  $y'' + 4y' + 8y = 0$

2.  $y'' - 3y' - 4y = 0$

5.  $y'' - 5y' - 14y = 0$

8.  $y'' + 4y' + 13y = 0$

3.  $y'' + 6y' + 9y = 0$

6.  $y'' + 2y' + 2y = 0$

9.  $y'' - 4y' + 5y = 0$

Solve the following initial value problems

10.  $y'' - 2y' + y = 0; y(0) = 1, y'(0) = 2$

13.  $y'' - 4y' + 13y = 0; y(0) = -1, y'(0) = 2$

11.  $y'' + y' - 2y = 0; y(0) = 0, y'(0) = 1$

14.  $y'' + 6y' + 5y = 0; y(0) = 0, y'(0) = 3$

12.  $y'' + 4y' + 3y = 0; y(0) = 2, y'(0) = 0$

15.  $2y'' - 2y' + y = 0; y(0) = -1, y'(0) = 0$

16. Express  $\left[2, \frac{\pi}{6}\right]$  in rectangular coordinates.

17. Express  $(4, -4)$  in polar coordinates.

18. Express  $y = x^2$  in polar coordinates.

19. Convert the polar equation  $r = 2 \cos \theta$  to an equation in rectangular coordinates. What is the graph?

20. Convert the polar equation  $r = \sec \theta + \csc \theta$  to an equation in rectangular coordinates.

21. Find the points of intersection of  $r = 1$  and  $r = 2 \sin \theta$

22. Convert the polar equation  $r = 2 \csc \theta$  to rectangular form.

Sketch the the following polar graphs

23.  $r = 1 - \sin \theta$

25.  $r = 1 - 2 \sin \theta$

27.  $r = 3 \sin \theta$

24.  $r = 2 - \sin \theta$

26.  $r = 3 \sin 2\theta$

28.  $r = 3 \sin 3\theta$

Find the polar equation for the given rectangular equation.

29.  $x^2 + y^2 = 9$

30.  $(x + 6)^2 + y^2 = 36$

Find the rectangular equation for the given polar equation.

31.  $r = 5 \sec \theta$

33.  $r + 4 \cos \theta = 0$

32.  $r^2 - 9 = 0$

34.  $r = \frac{1}{\sin \theta + 2 \cos \theta}$

Find the following areas

35. One petal of the rose  $r = 3 \cos 3\theta$

36. The region lying between the inner and outer loops of the limaçon  $r = 1 - 2 \sin \theta$

37. The region common to the two regions bounded by the following curves

$$r = -6 \cos \theta \quad r = 2 - 2 \cos \theta$$

38. Inside  $r = 2 \sin \theta$  and outside  $r = 1$

39. Inside both  $r = 4 \cos \theta$  and  $r = 2$

40. Inside both  $r = \cos \theta$  and  $r = \sqrt{3} \sin \theta$

41. Inside  $r = 2 + \cos \theta$  and outside  $r = 2$

42. Inside  $r = 3 + 2 \cos \theta$  and outside  $r = 4$

## Answers

1.  $y = c_1 e^x + c_2 e^{2x}$

2.  $y = c_1 e^{4x} + c_2 e^{-x}$

3.  $y = c_1 e^{-3x} + c_2 x e^{-3x}$

4.  $y = c_1 e^{4x} + c_2 x e^{4x}$

5.  $y = c_1 e^{-2x} + c_2 e^{7x}$

6.  $y = e^{-x} [c_1 \cos x + c_2 \sin x]$

7.  $y = e^{-2x} [c_1 \cos 2x + c_2 \sin 2x]$

8.  $y = e^{-2x} [c_1 \cos 3x + c_2 \sin 3x]$

9.  $y = e^{2x} [c_1 \cos x + c_2 \sin x]$

10.  $y = (1 + x)e^x$

11.  $y = \frac{1}{3}e^x - \frac{1}{3}e^{-2x}$

12.  $y = -e^{-3x} + 3e^{-x}$

13.  $y = e^{2x} \left[ -\cos 3x + \frac{4}{3} \sin 3x \right]$

14.  $y = -\frac{3}{4}e^{-5x} + \frac{3}{4}e^{-x}$

15.  $y = e^{x/2} [-\cos(x/2) + \sin(x/2)]$

16.  $(\sqrt{3}, 1)$

17.  $[4\sqrt{2}, -\frac{\pi}{4}]$

18.  $r = \sec \theta \tan \theta$

19.  $(x-1)^2 + y^2 = 1$  circle with center  $(1, 0)$  and radius 1.

20.  $(x-1)(y-1) = 1$

21.  $[1, \frac{\pi}{6}]$  and  $[1, \frac{5\pi}{6}]$

22.  $y = 2$

29.  $r = 3$

30.  $r = -12 \cos \theta$

31.  $x = 5$

32.  $x^2 + y^2 = 9$

33.  $(x+2)^2 + y^2 = 4$

34.  $y + 2x = 1$

35.  $\frac{3\pi}{4}$

36.  $\pi - \frac{3\sqrt{3}}{2}$

37.  $5\pi$

38.  $\frac{\pi}{3} + \frac{\sqrt{3}}{2}$

39.  $\frac{8\pi}{3} - 2\sqrt{3}$

40.  $\frac{5\pi}{24} - \frac{\sqrt{3}}{4}$

41.  $4 + \frac{\pi}{4}$

42.  $\frac{13\sqrt{3}}{2} - \frac{5\pi}{3}$