

**MAP2302: Differential Equations.**

<http://www.imathesis.com/map2302.html>

Practice 14.

**Topics:** 8.2, 8.3: Power Series Solutions to Linear Differential Equations.

Exercises 8.3 page 443:

Determine all the singular points of the given differential equation:

1.  $(x + 1)y'' - x^2y' + 3y = 0$

3.  $(\theta^2 - 2)y'' + 2y' + (\sin \theta)y = 0$

5.  $(t^2 - t - 2)x'' + (t + 1)x' - (t - 2)x = 0$

7.  $(\sin x)y'' + (\cos x)y = 0$

9.  $(\sin \theta)y'' - (\ln \theta)y = 0$

Find at least the first four nonzero terms in a power series expansion about  $x = 0$  for a general solution to the given differential equation:

11.  $y' + (x + 2)y = 0$

13.  $z'' - x^2z = 0$

15.  $y'' + (x - 1)y' + y = 0$

17.  $w'' - x^2w' + w = 0$

Find a power series expansion about  $x = 0$  for a general solution to the given differential equation.

19.  $y' - 2xy = 0$

Find at least the first four nonzero terms in a power series expansion about  $x = 0$  for the solution of the initial value problem:

25.  $w'' + 3xw' - w = 0$ ;  $w(0) = 2$ ,  $w'(0) = 0$ .

27.  $(x + 1)y'' - y = 0$ ;  $y(0) = 0$ ,  $y'(0) = 1$ .

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

Ans (28):  $-1 - \frac{x^2}{2} - \frac{x^3}{3} - \frac{x^4}{8} + \dots$