

## ODE

## Second Order ODE

## Complex Roots

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

2.  $y'' + y = 0$

3.  $y'' - 4y' + 13y = 0$

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

5.  $y'' + y' + y = 0$

6.  $y'' + 6y' + 13y = 0, y(0) = 0$

7.  $y'' = -2y$

8.  $9y'' = -25y$

9.  $y'' = -2y, y(\pi) = \frac{1}{2}$

10.  $y'' + 6y' + 25y = 0$

**Answers**

**ODE**

**Second Order ODE**

**Complex Roots**

$$1. y = e^{-t} \left( c_1 \cos(t) + c_2 \sin(t) \right)$$

$$2. y = c_1 \cos(t) + c_2 \sin(t)$$

$$3. y = e^{2t} \left( c_1 \cos(3t) + c_2 \sin(3t) \right)$$

$$4. y = e^{-\frac{t}{2}} \left( c_1 \cos(t) + c_2 \sin(t) \right)$$

$$5. y = e^{-\frac{t}{2}} \left( c_1 \cos\left(\frac{\sqrt{3}t}{2}\right) + c_2 \sin\left(\frac{\sqrt{3}t}{2}\right) \right)$$

$$6. y = c_2 e^{-3t} \sin(2t)$$

$$7. y = c_1 \cos\left(\sqrt{2}t\right) + c_2 \sin\left(\sqrt{2}t\right)$$

$$8. y = c_1 \cos\left(\frac{5t}{3}\right) + c_2 \sin\left(\frac{5t}{3}\right)$$

$$9. y = \frac{\cos\left(\sqrt{2}t\right) \left( 1 - 2\sin\left(\sqrt{2}\pi\right) c_2 \right)}{2\cos\left(\sqrt{2}\pi\right)} + c_2 \sin\left(\sqrt{2}t\right)$$

$$10. y = e^{-3t} \left( c_1 \cos(4t) + c_2 \sin(4t) \right)$$