

1. Use the formula  $y = v(t)e^{2t}$  to express the differential equation  $y' - 2y = t$  as a differential equation in terms of  $t$  and  $v(t)$ .

2. For what value of the constant  $k$  will the change of variables formula  $y = v(t)e^{kt}$  transform the differential equation  $y' + 3y = e^t$  into a differential equation that contains no  $v(t)$  term?

3. Use the formula  $y = v(t)e^{2t}$  to express the differential equation  $y'' - y' - 2y = 0$  as a differential equation in terms of  $t$  and  $v(t)$ .

4. Use the formula  $y = v(t)t$  to express the differential equation  $t^2y'' - ty' + y = 0$  as a differential equation in terms of  $t$  and  $v(t)$ .

5. Use the formula  $v(t) = y'(t)$  to express the differential equation  $y'' = ty'$  as a differential equation in terms of  $t$  and  $v(t)$ .

6. Use the formula  $v(y) = y'(t)$  to express the differential equation  $y'' = y'/y^2$  as a differential equation in terms of  $y$  and  $v(y)$ .