

Ken Mei

Test #2 Verison D, Question #3

Ken mei 4/24/23 Test #2 Solutions

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$$y'' - 3y' + 2y = -24e^{-2t}$$

$$(a) r^2 - 3r + 2 = 0$$

$$r_1 = 2, r_2 = 1$$

$$(r-2)(r-1) = 0$$

$$y_1 = e^{2t}, y_2 = e^{1t}$$

$$y = A e^{2t} + B e^{1t}$$

Case A:  $r_1, r_2 \neq \alpha$

Case B:  $r_1$  or  $r_2 = \alpha \cdot t$

Case C:  $r_1 = r_2 = \alpha \cdot t^2$

$$(b) y_p(t) = \frac{1}{r^2 - 3r + 2} (-24e^{-2t})$$

$$(-24e^{-2t}) \frac{1}{(r-2)(r-1)}$$

Plug  $\alpha = -2$  from  $-24e^{-2t}$  in for " $r$ "

$$(-24e^{-2t}) \frac{1}{(-2-2)(-2-1)} \rightarrow \frac{-24e^{-2t}}{(-4)(-3)}$$

$$y_p(t) = \frac{-24e^{-2t}}{12} = y_p(t) = -2e^{-2t}$$

(c) General solution:  $y(t) = y_p + A y_1 + B y_2 + y_0$

$$y(t) = -2e^{-2t} + A e^{2t} + B e^{1t}$$