Quiz 1 Solutions

(1.) Find r so that $y_1 = e^{rx}$ solves $y' - 5y = 0$

Sol: We want $0 = y_1' - 5y_1 = (e^{rx})' - 5(e^{rx})$

$= re^{rx} - 5e^{rx} = (r-5)e^{rx}$

so $\boxed{r = 5.}$

(2.) Find m and b so that $y_2 = mx + b$ solves $y' - 5y = 4x$

Sol: We want $4x = (mx+b)' - 5(mx+b)$

$= m - 5mx - 5b$

$= -5mx + (m - 5b)$

Two linear functions are equal when their slopes and intercepts agree, so we must have

$4 = -5m$ and $0 = m - 5b$

or $\boxed{m = -\frac{4}{5}}$ or $\boxed{b = \frac{m}{5} = \frac{-4}{25}}$

So $\boxed{y_2 = -\frac{4}{5}x - \frac{4}{25}}$

(3.) If $y = Ce^{5x} - \frac{4}{5}x - \frac{4}{25}$ then

$y' - 5y = 5Ce^{5x} - \frac{4}{5} - 5\left(Ce^{5x} - \frac{4}{5}x - \frac{4}{25}\right)$

$= 5Ce^{5x} - 5Ce^{5x} - \frac{4}{5} + 4x + \frac{4}{5} = 4x$ as required.

(4.) If $0 = y(0) = Ce^0 - \frac{4}{5}(0) - \frac{4}{25} = C - \frac{4}{25}$ then $\boxed{C = +\frac{4}{25}}$