

**HOMEWORK SET 1: REMEMBERING MATH**  
Due Friday, January 17, 2025

1) To get your math neurons firing again, perform the following operations (YOU MAY USE THE CRC):

$$\frac{d}{dt} e^{-kt} =$$

$$\frac{d}{dt} \frac{1}{kt} =$$

$$\frac{d}{dt} \ln(kt) =$$

$$\int e^{-kt} dt =$$

$$\int \frac{dt}{kt} =$$

$$\int \ln(t) dt =$$

$$\int \frac{dt}{1+kt} =$$

$$\int \frac{t dt}{1+kt} =$$

$$\int \frac{t dt}{1+kt^2} =$$

2) Show that  $x(t) = Ae^{-\beta t} \cos(\omega_s t)$ , where  $\omega_s^2 = \omega_N^2 - \beta^2$  is a solution to the differential equation of the damped harmonic oscillator,

$$\frac{d^2x}{dt^2} + 2\beta \frac{dx}{dt} + \omega_N^2 x = 0$$

