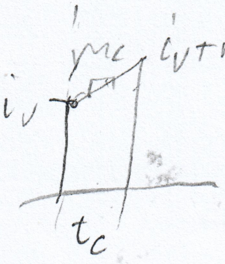

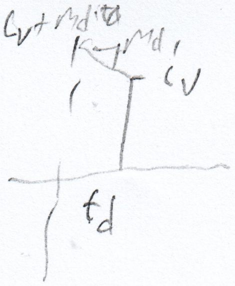

$$F(s) = \int_{-\infty}^{\infty} e^{-st} f(t)\, dt$$

$$\int e^{-ax}\, dx = -\frac{1}{a} e^{-ax}$$

$$\int x e^{-ax}\, dx = \left(\frac{x}{a} - \frac{1}{a^2}\right) e^{ax}$$

$$f_d(t) = i_v + m_d t_d - m_d t$$

$$f_c(t) = i_v + m_c t$$

$$F_c(s) = \int_0^{t_c} i_v e^{-st}\, dt + \int_0^{t_c} m_c t e^{-st}\, dt$$

$$i_v \left[-\frac{1}{s} e^{-st}\right]_0^{t_c} + \left[\left(\frac{t}{-s} - \frac{1}{s^2}\right) e^{-st}\right]_0^{t_c} m_c$$

$$-\frac{i_v}{s}\left(e^{-t_c} - 1\right) = \frac{i_v}{s}\left(1 - e^{-t_c}\right)$$

$$= i_v \frac{1 - e^{-t_c}}{s}$$

$$\left[-\left(\frac{t_c}{s} + \frac{1}{s^2}\right) e^{-st_c} + \left(0 + \frac{1}{s^2}\right) e^{-0}\right] m_c$$

$$\left(-\frac{st_c + 1}{s^2} e^{-st_c} + \frac{1}{s^2}\right) m_c$$

$$F_c(s) = i_v \left(\frac{1 - e^{-st_c}}{s}\right) + m_c \left(\frac{1 - (1 + st_c) e^{-st_c}}{s^2}\right)$$

$$F_D(s) = \left[(i_v + m_d t_d)\left(\frac{1 - e^{-st_d}}{s}\right) - m_d \left(\frac{1 - (1 + st_d) e^{-st_d}}{s^2}\right)\right] e^{-st_c}$$