Find the Inverse Laplace Transform of the given function.
Use partial Fractions when appropriate

Based on Q6 of H.W. 20

$$F(s) = \frac{5s^2 - 3s - 4}{s^3 + 5s^2 + 6s}$$

Apply partial fractions (do Algebra)

$$\frac{5s^2 - 3s - 4}{s(s^2 + 5s + 6)} = \frac{5s^2 - 3s - 4}{(s)(s+2)(s+3)} = \frac{A}{(s)} + \frac{B}{(s+2)} + \frac{C}{(s+3)}$$

$$5s^2 - 3s - 4 = A(s+2)(s+3) + B(s+3)(s) + C(s+2)(s)$$

put $s = 0$

$-4 = A(2)(3)$

$\frac{-4}{6} = \frac{A6}{6}$

$A = \frac{-4}{6}$

put $s = -2$

$20 + 6 - 4 = B(-2)$

$\frac{22}{-2} = \frac{B(-2)}{-2}$

$B = \frac{-22}{2}$

put $s = -3$

$45 + 9 - 4 = 3C$

$\frac{50}{3} = \frac{3C}{3}$

$C = \frac{50}{3}$

(Now Inverse laplace)

$$\mathcal{L}^{-1}\left[\frac{-4}{6s} + \frac{-22}{5(s+2)} + \frac{50}{3(s+3)}\right]$$

$$\frac{1}{6}\mathcal{L}^{-1}\left[\frac{-4}{s}\right] + \frac{-22}{5}\mathcal{L}^{-1}\left[\frac{1}{s+2}\right] + \frac{50}{3}\mathcal{L}^{-1}\left[\frac{1}{s+3}\right]$$

$$\frac{1}{6}(-4) + \frac{-22}{5}(e^{-2t}) + \frac{50}{3}(e^{-3t})$$

↑ Answer