1 Part 2

Find the inverse Laplace of the following $F(s)$:

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

2) $F(s) = \frac{5s^3-39s^2+14s-32}{(s^2-7s+10)(s^2+1)}$

3) $F(s) = \frac{5s^3+2s^2+4s+8}{s^2(s+2)^2(s-2)}$

1.1 1)

$$
\begin{aligned}
F(s) &= \frac{-s+5}{s^2+2s-3} \\
F(s) &= \frac{1}{s-1} - 2\frac{1}{s+3} \\
y(t) &= \mathcal{L}^{-1}\left(\frac{1}{s-1}\right) - 2\mathcal{L}^{-1}\left(\frac{1}{s+3}\right) \\
y(t) &= e^t - 2e^{-3t}
\end{aligned}
$$

$$\boxed{y(t) = e^t - 2e^{-3t}}$$

1.2 2)

$$
\begin{aligned}
F(s) &= \frac{5s^3-39s^2+14s-32}{(s^2-7s+10)(s^2+1)} \\
F(s) &= 8\frac{1}{s-2} - 4\frac{1}{s-5} + \frac{s}{s^2+1} \\
y(t) &= 8\mathcal{L}^{-1}\left(\frac{1}{s-2}\right) - 4\mathcal{L}^{-1}\left(\frac{1}{s-5}\right) + \mathcal{L}^{-1}\left(\frac{s}{s^2+1}\right) \\
y(t) &= 8e^{2t} - 4e^{5t} + \cos(t)
\end{aligned}
$$

$$\boxed{y(t) = 8e^{2t} - 4e^{5t} + \cos(t)}$$

1.3 3)

$$
\begin{aligned}
F(s) &= \frac{5s^3+2s^2+4s+8}{s^2(s+2)^2(s-2)} \\
F(s) &= -\frac{1}{s^2} - \frac{1}{s+2} + 2\frac{1}{(s+2)^2} + \frac{1}{s-2} \\
y(t) &= -\mathcal{L}^{-1}\left(\frac{1}{s^2}\right) - \mathcal{L}^{-1}\left(\frac{1}{s+2}\right) + 2\mathcal{L}^{-1}\left(\frac{1}{(s+2)^2}\right) + \mathcal{L}^{-1}\left(\frac{1}{s-2}\right) \\
y(t) &= -t - e^{-2t} + 2te^{-2t} + e^{2t}
\end{aligned}
$$

$$\boxed{y(t) = -t - e^{-2t} + 2te^{-2t} + e^{2t}}$$