1. Find the rest solution to the ODE

\[ y' + 2y = e^{3t}. \]

2. (a) Suppose \(|f(t)| \leq C|e^{at}|\) for some \(a > 0\). Show that if \(F(s) = \frac{Q(s)}{P(s)}\) for polynomials \(P\) and \(Q\), then \(\deg P > \deg Q\).

(b) Show that if \(|f'(t)| \leq Ce^{at}\) then \(\lim_{s \to \infty} sF(s) = f(0)\).

3. Find the Laplace transforms of

(a) \(f(t) = \cosh t \sin t\),

(b) \(g(t) = \int_0^t \frac{\sin \theta}{\theta} d\theta\),

(c) \(h(t) = e^{-t^2}\) (in as explicit a form as you can).

4. Find the inverse transform of

\[ F(s) = \frac{2s^3 + 6s^2 + 21s + 52}{s(s + 2)(s^2 + 4s + 13)}. \]