Laplace Transforms with shifts in the s domain

1. Find the Laplace Transform of $e^{2t}t^3$.

Solution: $\frac{6}{(s-2)^2}$

2. Find the Inverse Laplace Transform of

$$\frac{s+5}{s^2+4s+29}$$

Hint: start by "completing the square" in the denominator.

Solution: $e^{-2t}(\cos(5t) + \frac{3}{5}\sin(5t))$

Laplace Transform of Piecewise Continuous Functions

1. Find the Laplace Transform of

$$f(t) = \begin{cases} t & 0 \le t \le 1 \\ 2-t & 1 \le y \le 2 \\ 0 & t > 2 \end{cases}$$

Solution:

$$\frac{1}{s^2} - \frac{2e^{-s}}{s^2} + \frac{e^{-2s}}{s^2}$$

2. Find the Laplace Transform of

$$f(t) = \begin{cases} 0 & 0 \le t < 2 \\ \sin(\pi t) & 2 \le t < 3 \\ 0 & t \ge 3 \end{cases}$$

Solution:

$$\frac{\pi e^{-2s}}{s^2+\pi^2} + \frac{\pi e^{-3s}}{s^2+\pi^2}.$$