NAME: **SECTION:**

Laplace Transform $\mathcal{L}$

Time	**Frequency**	**Time**	**Frequency**
$f(t)$	$\mathcal{L}[f](s)$	$\mathcal{L}^{-1}[F](t)$	$F(s)$
$f+g$	$\mathcal{L}[f]+\mathcal{L}[g]$	cf	$c\mathcal{L}[f]$
f'	$s\mathcal{L}[f]-f(0)$	$f^{(n)}$	$s^nF(s)-s^{n-1}f(0)-\ldots-f^{(n-1)}(0)$
$tf(t)$	$-\frac{d}{ds}F(s)$	$t^nf(t)$	$(-1)^nF^{(n)}(s)$
$f(t)=f(t+T)$	$\frac{\int_0^T f(t)e^{-st}dt}{1-e^{-sT}}$	$f*g(t)=\int_0^t f(t-\tau)g(\tau)d\tau$	$\mathcal{L}[f]\mathcal{L}[g]$
$f(at)$	$\frac{1}{a}F\left(\frac{s}{a}\right)$	$\frac{1}{a}f\left(\frac{t}{a}\right)$	$F(as)$
1	$\frac{1}{s}$	$\delta(t-c)$	e^{-cs}
$e^{\lambda t}$	$\frac{1}{s-\lambda}$	$e^{\lambda t}f(t)$	$F(s-\lambda)$
t^n	$\frac{n!}{s^{n+1}}$	t^p for $p>-1$	$\frac{\Gamma(p+1)}{s^{p+1}}$
$\sin\omega t$	$\frac{\omega}{s^2+\omega^2}$	$\cos\omega t$	$\frac{s}{s^2+\omega^2}$
$\sinh at$	$\frac{1}{s^2-a^2}$	$\cosh at$	$\frac{s}{s^2-a^2}$
$u(t-c)$	$\frac{e^{-cs}}{s}$	$u(t-c)f(t-c)$	$e^{-cs}F(s)$

Heaviside unit step function u, Dirac delta δ, gamma function Γ

Quiz 11: Find the inverse Laplace transform of the frequency function

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

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