1. The Laplace transform of a function \( f(t) \) is defined to be the function
\[
F(s) = \int_0^\infty f(t)e^{-st} \, dt
\]

2. The Laplace transform of \( 3t - 2 \) is
\[
\frac{3}{s^2} - \frac{2}{s}
\]

3. The Laplace transform of \( e^{2t} - 3\sin(2t) \) is
\[
\frac{1}{s-2} - \frac{6}{s^2+4}
\]

4. The Laplace transform of \( e^{2t}\sin(2t) \) is
\[
\frac{2}{s^2-4s+8}
\]

5. The Laplace transform of \( (2t + 3)H(t - 1) \) is
\[
\frac{1}{2}e^{-s}(2 + 5s)
\]

6. If \( y(t) \) is a function with \( y(0) = 2 \) and \( Y(s) \) is the Laplace transform of \( y(t) \), then the Laplace transform of \( y'(t) \) is
\[
sY(s) - 2
\]

7. Suppose
\[
\frac{s + 1}{(s^2 + 1)(2s + 1)} = \frac{As + B}{s^2 + 1} + \frac{C}{2s + 1}
\]
Find \( A \).
\[
\frac{5}{3}
\]

8. Find the inverse Laplace transform of \( \frac{2s+1}{s^2+2s+2} \)
\[
e^{-t}(2\cos t - \sin t)
\]

9. If \( y(t) \) is the solution of the IVP: \( y'' - 2y' + 3y = t^2, y(0) = 1, y'(0) = 2 \). Then the Laplace transform of \( y \) is
\[
\frac{s^4 + 2}{s^3(s^2-2s+3)}
\]

10. Let \( \delta(t) \) be the delta-function. If \( y(t) \) is the solution of the IVP: \( 4y'' - 3y' - 7y = \delta(t), y(0) = y'(0) = 0 \), then the Laplace transform of \( y \) is
\[
\frac{1}{4s^2 - 3s - 7}
\]
11. The inverse Laplace transform of
\[ e^{-2s} \frac{s}{s + 1} \]
is
\[ \delta_2(t) - e^{-t+2}H(t - 2) \]

12. The convolution of \( f(t) \) and \( g(t) \) is defined as the function
\[ \int_0^t f(u)g(t - u) \, du \]

13. The convolution of \( t \) and \( t \) is
\[ \frac{t^3}{6} \]

14. The solution of \( y'' + 2y' + 3y = f(t) \), \( y(0) = y'(0) = 0 \), is the convolution of \( f(t) \) and what function?
\[ \frac{1}{\sqrt{2}} e^{-t} \sin(\sqrt{2}t) \]