

Step Functions

For problems 1 – 3 find the Laplace transform of the given function.

$$1. f(t) = 13u_{12}(t)e^{4-\frac{1}{3}t} + 9u_7(t)\sinh(5t-35)$$

$$2. g(t) = u_2(t)\sin(6t) - 8t^2u_4(t)$$

$$3. h(t) = \begin{cases} 6t & t < 4 \\ 8+4t & 4 \leq t < 8 \\ 4t+10e^{-t} & t \geq 8 \end{cases}$$

For problems 4 – 6 find the inverse transform of each of the following.

$$4. H(s) = \frac{3e^{-s}}{s} + \frac{7e^{-10s}}{s^2+16} + \frac{(s+7)e^{-4s}}{s^2+14s+58}$$

$$5. F(s) = \frac{8+4se^{-6s}-2e^{-10s}}{(s+3)(s-7)}$$

$$6. G(s) = \frac{se^{-5s}-12e^{-4s}+8se^{-3s}}{s(2s^2+8)}$$

IVP's with Laplace Transforms

Use Laplace transforms to solve the given IVP. In the partial fraction stage all quadratics that can be factored with integer coefficients must be factored!

$$7. y'' - 6y' + 9y = 7e^{3t} \quad y(0) = -8, y'(0) = -1$$

$$8. 4y'' - 48y' + 145y = 7e^t \quad y(0) = 0, y'(0) = 3$$

$$9. y'' + 9y = -4\sin(3t) \quad y(0) = 4, y'(0) = -7$$