

To calculate the inverse Laplace transform, you will use the following algebra techniques:

partial fractions,  
completing the square,  
adding 0, and  
multiplying by 1.

1. Look at denominator

i.) Does your denominator equal one of the following?  $s^n$ ,  $s - a$ ,  $s^2 \pm a^2$ , If so, use the appropriate formula.

ii.) Can you factor denominator over the reals? If so, factor and use partial fractions.

iii.) Do you need to complete the square? Example:

$$\begin{aligned} 10s^2 + 60s + 91 &= 10(s^2 + 6s) + 91 \\ &= 10(s^2 + 6 + 9 - 9) + 91 \\ &= 10(s^2 + 6 + 9) - 90 + 91 \\ &= 10(s + 3)^2 + 1 \end{aligned}$$

2. Look at the numerator

i.) Do you need  $s - a$ ? Try adding 0. For example to make  $s + \frac{3}{2}$  appear in  $5s + 21$ :

$$5s + 21 = 5\left(s + \frac{3}{2}\right) - \frac{15}{2} + 21 = 5\left(s + \frac{3}{2}\right) + \frac{27}{2}$$

ii) Do you need  $b$ ? Try multiplying by 1. For example, if you need  $\sqrt{\frac{7}{4}}$ , but you have  $\frac{27}{2}$ :  $\frac{27}{2} = \frac{27}{2} \sqrt{\frac{4}{7}} \sqrt{\frac{7}{4}}$