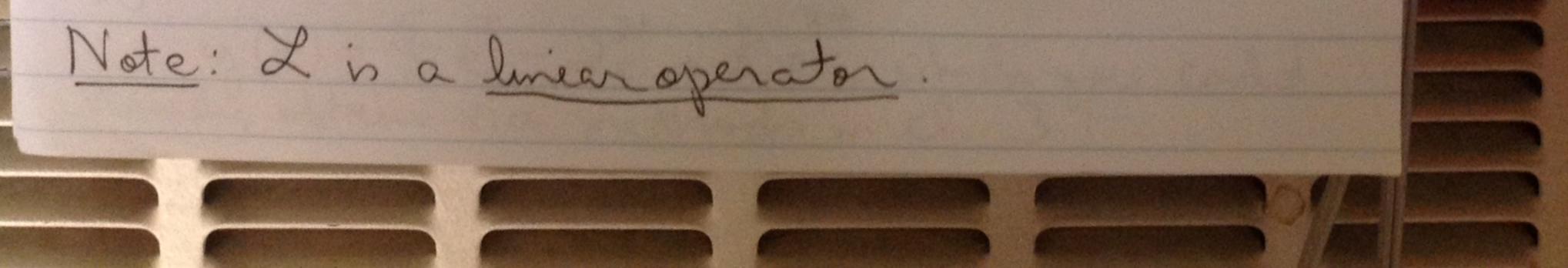
A.2.U ent ni ebeM A.Z.U off A (H) Laplace Transforms (6.1+2) (LD In practical applications (such as circuit analysis), the onhomogeneous function g(t) is sometimes zero except over a small interval of (time) t when it is very lage. In those, or other, discontinous cases we apply a transform method to twen the Function into something more tradible. (Soit of likeningen (a.b) = In a + In b to get a handle on the product of two large numbers, and then exponentiating to revense the processat the end.) f(t) -> F(s) = SK(s,t) f(t)dt is called an *L* ~ *(x) integral transform transformolf kernel* For f(t) defined on  $t \ge 0$ , the Laplace transform of f(t) is  $\int_{2}^{\infty} f(t) = F(s) = \int_{0}^{\infty} e^{st} f(t) dt$ , when it exists. So it is an integral transform with kernel e.  $\sum_{i=1}^{\infty} \mathcal{L}_{i}^{i} = s^{\circ} = s^{\circ} dt = \frac{-1}{s} \lim_{b \to \infty} e^{-st} (s > 0)$ Ljetz=Setedt=Setat=s-a (s>a) (see Table 6.2.1 p.317 for more)



(La)If f(t) is piecenise continuous and If(t) | = Ke<sup>at</sup> for some K, a E R and 0 ≤ t < 00, then Lif(t)} = F(s) exists for s>a.

By simply applying the integral definition, it is easy to see:

Liy'3= 5Liyi - y(0) Liy"= 52Liyi - sylo) - y'(0) gunes, with y'(0)=go, 50 Z 2 ay" + by + cy = f(t) }  $\mathcal{L}\{y\} = \frac{(as+b)y_0 + ay_0' + F(s)}{as^2 + bs+c} = Y(s)$ and the solution to the initial value problem is y(t) = 2 - 2 Y(s) }, which you lookup on Table 6, 2.1 (after doing some partial fraction decomposition, in all Inkelihood). Solve y"- 3y'+ 2y = e, y(0)=1, y'(0)=0 Letting  $Y(s) = \mathcal{L}(y|t)$  + taking Laplace transforms of both sides gives  $s^2 Y(s) - s - 3 [s Y(s) - 1] + 2 Y(s) = 1$ so algebra yields  $Y(s) = 1 + s - 3 = 5/2 - 2 + \frac{1}{2}$  $(5-3)(s^2-3s+2) = s^2-3s^2+2 = s-1 = s-2 = s-3$ =  $2\{s^2=t^2-2s^2+t^2=s^2\}$ 50

