I simply copied this table from the textbook. I probably shouldn't have copied down #3 and #4.
You should just use $\mathcal{L}\{e^{at}\}$ in # 2. Then $\mathcal{L}\{\sinh at\} = \frac{1}{2}(\mathcal{L}\{e^{at}\} - \mathcal{L}\{e^{-at}\})$.

Note $\frac{a}{s^2-a^2} = \frac{a}{(s+a)(s-a)} = \frac{-\frac{1}{2}}{s+a} + \frac{\frac{1}{2}}{s-a}$. It's just simpler to ignore #3 and #4.
Always do partial fraction decomposition first.

Table of Laplace Transforms

$f(t) = \mathcal{L}^{-1}\{F(s)\}$	$F(s) = \mathcal{L}\{f(t)\}$
1. 1	$\frac{1}{s}$, $s > 0$
2. e^{at}	$\frac{1}{s-a}$, $s > a$
3. $\sinh at = \frac{e^{at}-e^{-at}}{2}$	$\frac{a}{s^2-a^2}$, $s > \lvert a\rvert$
4. $\cosh at = \frac{e^{at}+e^{-at}}{2}$	$\frac{s}{s^2-a^2}$, $s > \lvert a\rvert$
5. t^n, $n =$positive integer	$\frac{n!}{s^{n+1}}$, $s > 0$
6. $t^n e^{at}$, $n =$ positive integer	$\frac{n!}{(s-a)^{n+1}}$, $s > a$
7. $\sin bt$	$\frac{b}{s^2+b^2}$, $s > 0$
8. $\cos bt$	$\frac{s}{s^2+b^2}$, $s > 0$
9. $e^{at}\sin bt$	$\frac{b}{(s-a)^2+b^2}$, $s > a$
10. $e^{at}\cos bt$	$\frac{s-a}{(s-a)^2+b^2}$, $s > a$
11. $u_c(t)$	$\frac{e^{-cs}}{s}$, $s > 0$
12. $u_c(t)f(t-c)$	$e^{-cs}F(s)$
13. $e^{ct}f(t)$	$F(s-c)$
14. $\delta(t-c)$	e^{-cs} when $c \geq 0$; 0 when $c < 0$
15. $f^{(n)}(t)$	$s^nF(s) - s^{n-1}f(0) - \cdots - f^{(n-1)}(0)$
16. $(-t)^n f(t)$	$F^{(n)}(s)$
17. $\int_0^t f(t-\tau)g(\tau)d\tau$	$F(s)G(s)$