# Table of LaPlace Transforms

<table>
<thead>
<tr>
<th>( f(t) )</th>
<th>( \mathcal{L} { f(t) } = F(s) )</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>( \frac{1}{s} )</td>
<td>14. ( \sinh^2 kt )</td>
<td>( \frac{2k^2}{s(s^2 - 4k^2)} )</td>
<td>27. ( t \cosh kt )</td>
<td>( \frac{s^2 + k^2}{(s^2 + k^2)^2} )</td>
</tr>
<tr>
<td>2</td>
<td>( \frac{1}{s^2} )</td>
<td>15. ( \cosh^2 kt )</td>
<td>( \frac{s^2 - 2k^2}{s(s^2 - 4k^2)} )</td>
<td>28. ( e^{at} - e^{bt} )</td>
<td>( \frac{1}{a-b} )</td>
</tr>
<tr>
<td>3</td>
<td>( \frac{n!}{s^{n+1}} ), ( n ) is a positive integer</td>
<td>16. ( te^{at} )</td>
<td>( \frac{1}{(s-a)^2} )</td>
<td>29. ( ae^{at} - be^{bt} )</td>
<td>( \frac{s}{(s-a)(s-b)} )</td>
</tr>
<tr>
<td>4</td>
<td>( \sqrt{\frac{\pi}{2}} )</td>
<td>17. ( t^{n}e^{at} )</td>
<td>( \frac{n!}{(s-a)^{n+1}} ), ( n ) is a positive integer</td>
<td>30. ( 1 - \cos kt )</td>
<td>( \frac{k^2}{s(s^2 + k^2)} )</td>
</tr>
<tr>
<td>5</td>
<td>( \frac{\sqrt{\pi}}{2s^{3/2}} )</td>
<td>18. ( e^{at} \sin kt )</td>
<td>( \frac{k}{(s-a)^2 + k^2} )</td>
<td>31. ( kt - \sin kt )</td>
<td>( \frac{k^3}{s^2(s^2 + k^2)} )</td>
</tr>
<tr>
<td>6</td>
<td>( \frac{\Gamma(\alpha+1)}{s^{\alpha+1}} ), ( \alpha &gt; -1 )</td>
<td>19. ( e^{at} \cos kt )</td>
<td>( \frac{s-a}{(s-a)^2 + k^2} )</td>
<td>32. ( \frac{a \sin bt - b \sin at}{ab(a^2 - b^2)} )</td>
<td>( \frac{1}{(s^2 + a^2)(s^2 + b^2)} )</td>
</tr>
<tr>
<td>7</td>
<td>( \sin kt )</td>
<td>20. ( e^{at} \sinh kt )</td>
<td>( \frac{k}{(s-a)^2 - k^2} )</td>
<td>33. ( \cos bt - \cos at )</td>
<td>( \frac{s}{(s^2 + a^2)(s^2 + b^2)} )</td>
</tr>
<tr>
<td>8</td>
<td>( \cos kt )</td>
<td>21. ( e^{at} \cosh kt )</td>
<td>( \frac{s-a}{(s-a)^2 - k^2} )</td>
<td>34. ( \sin kt \sinh kt )</td>
<td>( \frac{2k^2s}{s^4 + 4k^4} )</td>
</tr>
<tr>
<td>9</td>
<td>( \sin^2 kt )</td>
<td>22. ( \frac{2k^2}{s(s^2 + 4k^2)} )</td>
<td>22. ( t \sin kt )</td>
<td>( \frac{2ks}{(s^2 + k^2)^2} )</td>
<td>35. ( \sin kt \cos kt )</td>
</tr>
<tr>
<td>10</td>
<td>( \cos^2 kt )</td>
<td>( \frac{s^2 + 2k^2}{s(s^2 + 4k^2)} )</td>
<td>23. ( \frac{s^2 - k^2}{s(s^2 + k^2)^2} )</td>
<td>36. ( \cos kt \sinh kt )</td>
<td>( \frac{k(s^2 - 2k^2)}{s^4 + 4k^4} )</td>
</tr>
<tr>
<td>11</td>
<td>( \frac{1}{s-a} )</td>
<td>24. ( \sin kt + kt \cos kt )</td>
<td>( \frac{2kss}{(s^2 + k^2)^2} )</td>
<td>37. ( \cos kt \cosh kt )</td>
<td>( \frac{s^3}{s^4 + 4k^4} )</td>
</tr>
<tr>
<td>12</td>
<td>( \frac{k}{s^2 - k^2} )</td>
<td>25. ( \sin kt - kt \cos kt )</td>
<td>( \frac{2kss^3}{(s^2 + k^2)^2} )</td>
<td>38. ( J_0(kt) )</td>
<td>( \frac{1}{\sqrt{s^2 + k^2}} )</td>
</tr>
<tr>
<td>13</td>
<td>( \frac{s}{s^2 - k^2} )</td>
<td>26. ( \frac{2ks}{(s^2 - k^2)^2} )</td>
<td>26. ( t \sinh kt )</td>
<td></td>
<td>( \frac{e^{bt} - e^{at}}{t} )</td>
</tr>
</tbody>
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<thead>
<tr>
<th>$f(t)$</th>
<th>$\mathcal{L}{f(t)} = F(s)$</th>
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<tr>
<td>$2(1-\cos kt)$</td>
<td>$\frac{1}{t}\ln\left(\frac{s^2 + k^2}{s^2}\right)$</td>
<td>$\delta(t)$</td>
<td>1</td>
</tr>
<tr>
<td>$2(1-\cosh kt)$</td>
<td>$\frac{1}{t}\ln\left(\frac{s^2 - k^2}{s^2}\right)$</td>
<td>$\delta(t-t_0)$</td>
<td>$e^{-as}$</td>
</tr>
<tr>
<td>$\frac{\sin at}{t}$</td>
<td>$\arctan\left(\frac{a}{s}\right)$</td>
<td>$e^{at}f(t)$</td>
<td>$F(s-a)$</td>
</tr>
<tr>
<td>$\frac{\sin at \cos bt}{t}$</td>
<td>$\frac{1}{2}\arctan\left(\frac{a+b}{s}\right) + \frac{1}{2}\arctan\left(\frac{a-b}{s}\right)$</td>
<td>$f(t-a)\mathcal{U}(t-a)$</td>
<td>$e^{-as}F(s)$</td>
</tr>
<tr>
<td>$\frac{1}{\sqrt{\pi t}}e^{-\frac{a^2}{4t}}$</td>
<td>$\frac{e^{-\frac{as}{\sqrt{s}}}}{\sqrt{s}}$</td>
<td>$\mathcal{U}(t-a)$</td>
<td>$\frac{e^{-as}}{s}$</td>
</tr>
<tr>
<td>$\frac{a}{2\sqrt{\pi t}}e^{-\frac{a^2}{4t}}$</td>
<td>$e^{-\frac{as}{\sqrt{s}}}$</td>
<td>$f^{(n)}(t)$</td>
<td>$s^nF(s) - s^{(n-1)}f(0) - \ldots - f^{(n-1)}(0)$</td>
</tr>
<tr>
<td>$\text{erfc}\left(\frac{a}{2\sqrt{t}}\right)$</td>
<td>$\frac{e^{-\frac{as}{\sqrt{s}}}}{s}$</td>
<td>$t^n f(t)$</td>
<td>$(-1)^n \frac{d^n}{ds^n} F(s)$</td>
</tr>
<tr>
<td>$2\sqrt{\frac{t}{\pi}}e^{-\frac{a^2}{4t}} - a \cdot \text{erfc}\left(\frac{a}{2\sqrt{t}}\right)$</td>
<td>$\frac{e^{-\frac{as}{\sqrt{s}}}}{s\sqrt{s}}$</td>
<td>( \int_0^t f(\tau)g(t-\tau)d\tau )</td>
<td>$F(s)G(s)$</td>
</tr>
<tr>
<td>$e^{ab}e^{b\tau} \cdot \text{erfc}\left(b\sqrt{t} + \frac{a}{2\sqrt{t}}\right)$</td>
<td>$\frac{e^{-\frac{as}{\sqrt{s}}}}{\sqrt{s}\left(\sqrt{s} + b\right)}$</td>
<td>$\frac{b\cdot e^{-\frac{as}{\sqrt{s}}}}{\sqrt{s}\left(\sqrt{s} + b\right)}$</td>
<td>$b\cdot e^{-\frac{as}{\sqrt{s}}}$</td>
</tr>
</tbody>
</table>