1 Oppgave 9

$$f(t) = \left\{ 0 \ if \ 0 \leq t < 1, \ 1 \ if \ 1 \leq t \right\}$$

$$L\{f(t)\} \Rightarrow f(s)$$

$$L\{f(t)\} = \int\limits_0^\infty e^{-st} f(t) dt$$

$$L\{0\} = \int\limits_0^\infty e^{-st} 0 dt = 0$$

$$L\{1\} = \int\limits_0^\infty e^{-st} 1 dt$$

$$\lim_{A\to\infty} \int\limits_0^A e^{-st} dt$$

$$\lim_{A\to\infty} [-\tfrac{1}{s} e^{-st}] = \lim_{A\to\infty} (-\tfrac{1}{s} e^{-st} - (-\tfrac{1}{s}))$$

$$\lim_{A\to\infty} [-\tfrac{1}{s} e^{-st} + \tfrac{1}{s}] = \underline{\underline{\tfrac{1}{s}}}$$

2 Oppgave 1

$f(t) = 3t^2 + 2t + 1,\, t \geq 0$
$3L\{t^2\} + 2Lt + L1$
$L\{t^n\} = \frac{n!}{s^{n+1}}$
$L\{t^2\} = \frac{2}{s^3}$
$L\{t\} = \frac{1}{s^2}$
$L\{1\} = \frac{1}{s}$
$= 3 \cdot \frac{2}{s^3} + 2 \cdot \frac{1}{s^2} + \frac{1}{s} = \underline{\underline{\frac{6}{s^2} + \frac{2}{s^2} + \frac{1}{s}}}$

3 Oppgave 13

$F(s) = \frac{3}{s} + \frac{24}{s^2}$
$L^{-1}\{\frac{3}{s} + \frac{24}{s^2}\} = L^{-1}\{\frac{3}{s}\} + L^{-1}\{\frac{24}{s^2}\}$
$L^{-1}\{\frac{1}{s}\} = 1$
$3L^{-1}\{\frac{1}{s}\} = \underline{3}$
$L^{-1}\{\frac{24}{s^2}\} = 24L^{-1}\{\frac{1}{s^2}\}$
$L^{-1}\{\frac{n!}{s^{n+1}}\} = t^n$
$24L^{-1}\{\frac{1}{s^2}\} = \underline{24t}$
$L^{-1}\{\frac{3}{s} + \frac{24}{s^2}\} = \underline{\underline{3 + 24t}}$

4 Oppave 23

$f(t) = \sin(t-2\pi)h(t-2\pi)$
$a(b-c) = ab - ac$
$a = \sin(t-2\pi)h,\ b = t,\ c = 2\pi$
$ht\sin(t-2\pi) - 2\pi h\sin(t-2\pi)$
$L\{ht\sin(t-2\pi) - 2\pi h\sin(t-2\pi)\}$
$L\{a\cdot f(t) + b\cdot g(t)\} = a\cdot L\{f(t)\} + b\cdot L\{g(t)\}$
$= hL\{t\sin(t-2\pi)\} - 2\pi hL\{\sin(t-2\pi)\}$
$L\{f(t)\} = F(s),\ \ L\{t^k f(t)\} = (-1)^k \frac{d}{ds^k}(F(s))$
$L\{\sin(at-b)\} = \frac{s\cdot\sin(b)+a\cdot\cos(b)}{s^2+a^1}$
$L\{\sin(t-2\pi\} = \frac{\sin(-2\pi)s+1\cdot\cos(-2\pi)}{s^2+1^2} = \underline{\frac{1}{s^1+1}}$
$\frac{d}{ds}(\frac{1}{s^2+1}) = \frac{d}{ds}((s^2+1)^{-1})$
$\frac{df(u)}{dx} = \frac{df}{du}\cdot\frac{du}{dx},\ f = u^{-1},\ u = (s^2+1)$
$\frac{d}{du}(u^{-1})\cdot\frac{d}{ds}(s^2+1)$
$\frac{d}{du}(u^{-1}) = \underline{-\frac{1}{u^2}}$
$\frac{d}{ds}(s^2+1) = (f\pm g)' = \underline{2s}$
$(-\frac{1}{u^2})\cdot 2s = (-\frac{1}{(s^2+1)^2})\cdot 2s = -\frac{2s}{(s^2+1)^2}$
$(-1)\cdot(-\frac{2s}{(s^2+1)^2} = \underline{\frac{2s}{(s^2+1)^2}}$
$h\frac{2s}{(s^2+1)} - 2\pi hL\{\sin(t-2\pi)\} = \underline{\underline{\frac{2hs}{(s^2+1)^2} - \frac{2\pi h}{s^2+1}}}$