Lab 9: Laplace Transform

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Section No. 4

Question 1

a)

```
syms t;
f = (1/sqrt(3)).*(sin(sqrt(3)*t)+(2*cos(sqrt(3)*t))).*exp(-t).*heaviside(t+1);
Xs = laplace(f)
```

```
Xs =
```

$$\frac{\sqrt{3}\left(\frac{2\,(s+1)}{(s+1)^2+3}+\frac{\sqrt{3}}{(s+1)^2+3}\right)}{3}$$

```
num = [0 0 2 2+sqrt(3)];
den = [0 1*sqrt(3) 2*sqrt(3) 4*sqrt(3)];
zero = roots(num)
```

```
zero = -1.8660
```

```
poles= roots(den)
```

b)

```
syms t;
f = (0.5.*t.*(heaviside(t)-heaviside(t-2)))+(-0.5.*t.*(heaviside(t-2)-
heaviside(t-4)));
Xs = laplace(f)
```

```
Xs =
```

$$\frac{2\,\mathrm{e}^{-4s}}{s}-\frac{\mathrm{e}^{-2s}}{s^2}-\frac{2\,\mathrm{e}^{-2s}}{s}+\frac{\mathrm{e}^{-4s}}{2\,s^2}+\frac{1}{2\,s^2}$$

c)

```
syms t;
f = heaviside(t)-(2.*heaviside(t-1))+heaviside(t-3);
Xs = laplace(f)
```

```
Xs =
```

$$\frac{\mathrm{e}^{-3s}}{s}-\frac{2\,\mathrm{e}^{-s}}{s}+\frac{1}{s}$$

d)

```
syms t;
f = exp(-abs(t-1)).*heaviside(t-1);
Xs = laplace(f)
```

Xs =

$$\frac{e^{-s}}{s+1}$$

Question 2

a)

```
syms s;
Xs = ((5.*s) - 3)/((s+1).*(s+2).*(s+3));
Xt = ilaplace(Xs)
```

Xt = $13\,e^{-2t} - 4\,e^{-t} - 9\,e^{-3t}$

b)

```
syms s;
Xs = 1/(s.*((s+1).^3).*(s+2));
Xt = ilaplace(Xs)
```

Xt =

$$\frac{e^{-2t}}{2} - e^{-t} - \frac{t^2 e^{-t}}{2} + \frac{1}{2}$$

c)

```
syms s;
Xs = (1-(s.*exp(-s)))/(s.*(s+2));
Xt = ilaplace(Xs)
```

Xt =

$$\frac{1}{2} - \text{heaviside}(t-1)\,e^{2-2t} - \frac{e^{-2t}}{2}$$

d)

```
syms s;
Xs = ((s.^2)-3)/((s+1).*(s+2));
Xt = ilaplace(Xs)
```

Xt = $\delta(t) - e^{-2t} - 2\,e^{-t}$