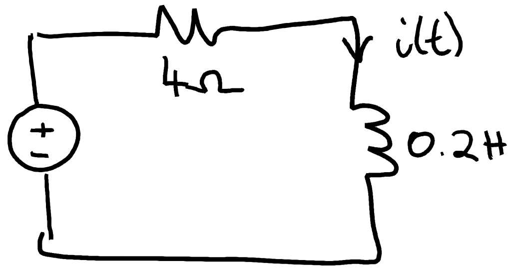
At Tutorial 8 – Marked Question (9th August 2019)

Chapter 14 Ex 48a: Laplace Transformations

For the circuit below, write the **s**-domain KVL equation in terms of **I(s)**. Rearrange and simplify the equation to get an **s**-domain expression for I**(s)**.

$$V(s) = \frac{2}{s} - \frac{1}{s+1}\ V$$



$i(0^-) = 2A$

At Tutorial 8 – Unmarked Questions (9th August 2019)

Chapter 14, Ex 27: Laplace Transformations
Using the Laplace transform tables, determine **F(s)** if $f(t)$ is equal to:

a) $3u(t-2)$

b) $3e^{-2t}u(t) + 5u(t)$

c) $\delta(t) + u(t) - tu(t)$

d) $5\delta(t)$

Chapter 14, Ex 35: Laplace Transforms
Determine the inverse transform of **F(s)** equal to:

a) $5 + \frac{5}{s^2} - \frac{5}{(s+1)}$

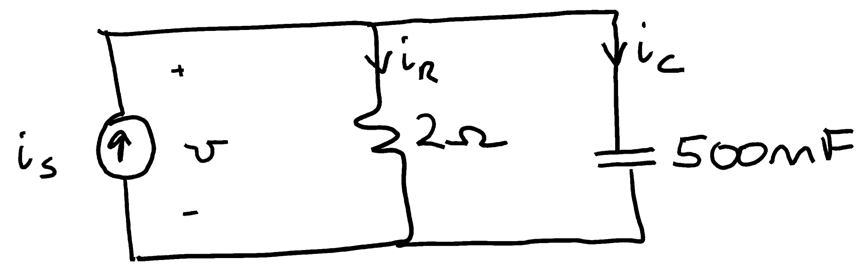
b) $\frac{1}{s} + \frac{5}{0.1s+4} - 3$

c) $-\frac{1}{2s} + \frac{1}{(0.5s)^2} + \frac{4}{(s+5)(s+5)} + 2$

d) $\frac{4}{(s+5)(s+5)} + \frac{2}{s+1} + \frac{1}{s+3}$

Chapter 14, Ex 46: Laplace Transformations

For the circuit below, the initial voltage across the capacitor is $v(0^-)$ = 1.5 V and the current source is $i_s = 700u(t)$ mA.



a) Write the differential equation which arises from KCL, in terms of the nodal voltage $v(t)$.

b) Take the Laplace transform of the differential equation.

c) Determine the frequency-domain representation of the nodal voltage

Chapter 14, Ex 61: Impedance

The voltage $v(t) = 8e^{-2}\ u(t)$ V is applied to a two-terminal device. Your assistant misunderstands you and only records the **s**-domain current which results. Determine what type of element it is and its value if **I(s)** is equal to:

a) $\frac{1}{s+2}$ A

b) $\frac{4}{s(s+2)}$ A

Chapter 14, Ex 64a: Time-Domain Mesh Analysis, LT, Inverse LT

Referring to the circuit below and keeping the circuit in the time-domain, develop an expression for **I$_c$(s)**, then determine $i_C(t)$ for t > 0 if $i_s(t) = 2u(t+2)$ A and $v_s(t) = 2u(t)$ V. HINTS: You can work out the initial conditions using techniques from term 2. Use mesh analysis in the time domain for t > 0. Voltage drop across a capacitor is $v_c(t) = \frac{1}{C}\int_{t_0}^{t} i(T)\,dT + v_c(t_0)$.