**Laplace Transform assignment**

[1] Consider the signal:

1. Write the Laplace transform of.

**Answer**: where

1. Sketch the location of poles and zeroes of.

**Answer:** Poles at: s=2 and s=3

[2] Determine the Laplace transform using its definition and determine the pole and zero locations for each of the following time functions:

**Answer:**

**[a]**

Note that the transform will converge (the integral exists t tends to infinity in our case) only when the real part of is positive. This means:

Or:

To get the poles: set the denominator of to zero: . Thus the pole is at . Since *a* is positive, the pole is on the right half of the s-plane.

**[b]**

Note that the transform will converge only when the real part of is positive. This means:

Or:

To get the poles: set the denominator of to zero: .

Thus the pole is at: Since *a* is negative, the pole is also on the right half of the s-plane.

**[c]**

When substituting with the lower limit (), must have a negative real part to have a finite limit. This means:

Or:

To get the poles: set the denominator of to zero: .

Thus the pole is at: Since *a* is positive, the pole is on the left half of the s-plane.

[3] Use Laplace transform properties and lookup tables to determine the Laplace transform of each of the following:

1. [Please correct in the assignment]
2. [Please correct in the assignment]

Answers:

1. defined at all s

This is the sum of an infinite geometric series with a first term=1 and ratio

As we know the sum of infinite geometric series is: (A is the first term and r is the common ratio). The sum converges only when

The solution is hence:

With the condition that: . This means that:

Tus:

Thus:

1. Since:

In tables:

[4] Use Laplace transform properties and lookup tables to find x(t) if X(s) is given by:

Provided that is right sided (i.e. defined only on the interval: )

**Answer:**

Using partial fractions:

Using Laplace transform table: and using the property of shifting in s-domain:

or equivalently: . So the answer is:

[5] An LTI system has an impulse response h(t) for which the Laplace transform H(s) is:

Determine the system output y(t) for all t if the input x(t) is given by