ECE 442/542  
1st Homework  
Spring 2004

1) Prove the damping property of the $z$-Transform.
2) Prove the differentiation property of the $z$-Transform.
3) Prove the two convolution properties of the $z$-Transform.
4) Given the function:

$$f(t)$$

$$
\begin{array}{c}
-2 \\
-1 \\
0 \\
1 \\
2
\end{array}
\begin{array}{c}
-1 \\
0 \\
1 \\
2 \\
3 \\
4 \\
5 \\
6 \\
7 \\
8 \\
9
\end{array}
\rightarrow \text{periodic for } t > 0.
$$

a) Let $r(t)$ be the Ramp function. Express $f(t)$ as an infinite sum of ramp functions.
b) Write \( F(s) \) as an infinite sum.

c) Convert \( F(s) \) to a closed expression.
   
   Hint: Exploit the periodicity.

\[ F(s) \]

d) Perform a partial fraction expansion on \( F(s) \).

e) Find \( F^*(s) \) using the partial fraction expansion (\( T=1 \text{sec} \)).

f) Find \( F(t) \) in closed form.
5) Given the function:

\[ f(t) \]

a) Find \( F(z) \) as an infinite sum.
b) Convert \( F(z) \) to a closed expression. Hint: Again exploit the periodicity.
c) Compare the result with that of problem #4. Which of the two approaches?