# Armstrong State University
# Engineering Studies
# MATLAB Marina – Differentiation Exercises

1. Write a MATLAB program that will:
   - Create a vector t consisting of 100 values over the interval of -5 to 5 seconds.
   - Evaluate the function $f(t) = -2t^2 + 3t + 7$ for the vector t.
   - Using the MATLAB `diff` function, compute the forward first derivative of $f(t)$ with respect to t.
   - Evaluate the analytical first derivative of $f(t)$, i.e. determine $\frac{df(t)}{dt}$ by hand and evaluate this function in your MATLAB program.
   - Plot the analytical and approximate (numerical) first derivative on the same plot in a single figure window. Title and label the plot appropriately. A legend is appropriate here.
   - How does the approximate first derivative compare to the analytical first derivative?
2. Write a MATLAB program that will:
   - Create a vector t consisting of 100 values over the interval of 0 to 8 seconds.
   - Evaluate the function $g(t) = 5te^{-0.5t}$ for the vector t.
   - Using the MATLAB `diff` function, compute the backwards first difference of $g(t)$ with respect to t.
   - Determine the analytical first derivative of $g(t)$, i.e. determine $\frac{dg(t)}{dt}$ by hand and evaluate this function in your MATLAB program.
   - Plot the analytical and approximate (numerical) first derivative on the same plot in a single figure window. Title and label the plot appropriately. A legend is appropriate here.
   - How does the approximate first derivative compare to the analytical first derivative?
3. Write a MATLAB program that will repeat the operations of exercise 2 except using only 20 values over the interval of 0 to 8 seconds for the t vector. How does the approximate first derivative compare to the analytical first derivative?

Last modified Thursday, November 13, 2014