MAT 116E Advanced Scientific and Engineering Computing

Lab-11

Q-1.

a) Let $f(x) = \sin(e^x)$. Find the $f'(x)$ by using limit definition of the derivative and compare your result by using **diff** command.

$$f'(x) = \lim_{h \to 0} \frac{f(x + h) - f(x)}{h}$$

b) Evaluate the following expressions.

   i. $\int x^2 \cos x \, dx$

   ii. $\lim\limits_{x \to 0^-} \dfrac{|x|}{x}$

   iii. $\int_0^\pi \dfrac{\cos^2 x}{1 + \sin^2 x} \, dx$

Q-2. A ceramic tile has the design shown in the figure. The shaded area is painted red and the rest of tile is white. The border line between the red and the White areas follows the equation

$$y = -kx^2 + 12kx$$

Determine k such that the areas of the white and the red colors will be the same and plot it for $0 \le x \le 12$ and $0 \le y \le 15$.