MAT 212, Quiz #1, Summer 2016 Name KEY

Instructions: Show all work. Answers without work required to obtain the solution will not receive full credit. Some questions may contain multiple parts: be sure to answer all of them. Give exact answers unless specifically asked to estimate.

1. Perform the indicated operation.
   a. Differentiate $y = 5e^{-3t}\cos 4t + t\ln(\cos t)$

$$y' = 5(-3)e^{-3t}\cos 4t + 5e^{-3t}(4)(-\sin 4t) + \ln|\cos t| + t\cdot\frac{-\sin t}{\cos t}$$

$$= \boxed{-15e^{-3t}\cos 4t - 20e^{-3t}\sin 4t + \ln|\cos t| - t\tan t}$$

   b. Integrate $\int \frac{2t+1}{(t^2+1)(t-3)}\,dt$

$$\frac{At+B}{t^2+1} + \frac{C}{t-3}$$

$$At^2 + Bt - 3At - 3B + Ct^2 + C = 2t + 1$$

$$A + C = 0$$
$$-3A + B = 2$$
$$-3B + C = 1$$

$$\left[\begin{array}{ccc|c} 1 & 0 & 1 & 0 \\ -3 & 1 & 0 & 2 \\ 0 & -3 & 1 & 1 \end{array}\right]$$

$A = -7/10$

$B = -1/10$

$C = 7/10$

$$= \int -\frac{7}{10}\cdot\frac{t}{t^2+1} - \frac{1}{10}\cdot\frac{1}{t^2+1} + \frac{7}{10}\cdot\frac{1}{t-3}\,dt$$

$$= \boxed{-\frac{7}{20}\ln|t^2+1| - \frac{1}{10}\arctan t + \frac{7}{10}\ln|t-3| + C}$$

2. Write the following expressions in standard $(a + bi)$ form.
   a. $e^{(-2+i)t}$
   b. t^{1-i}

$$e^{-2t}\cdot e^{it}$$

$$e^{-2t}(\cos t + i\sin t)$$

$$e^{-2t}\cos t + ie^{-2t}\sin t$$

$$t^1\cdot t^{-i}$$

$$t^1(e^{\ln t})^{-i} = t\cdot e^{-i(\ln t)}$$

$$t(\cos(\ln t) - i\sin(\ln t))$$

$$= t\cos(\ln t) - it\sin(\ln t)$$