

EE20N Spring 2011  
Diagnostic Quiz

Take a deep breath, you will not be graded on this quiz. You should complete this quiz **then** look at the provided solutions. Students with solid prerequisites should be able to finish this quiz in about 15 minutes. If you have trouble, you may have a learning curve to catch up with the course, and if so you should contact your lab GSI or the professors.

**1.** (0 points) *Complex numbers*

Let

$$\begin{aligned}x &= 1 - i \\ y &= 2e^{i\frac{\pi}{3}}\end{aligned}$$

where  $i = \sqrt{-1}$ .

(a)  $x - y = ?$

(b)  $xy = ?$

**2.** (0 points) *Calculus*

$$\int_{-1}^1 [e^{2t} + \sin(t)] dt = ?$$

**3.** (0 points) *Composite functions*

If  $x(t) = \sin(3t)$ , plot  $y(t) = x(-2t + 2)$ , labeling maxima, minima, and zero-crossings.

**4.** (*0 points*) *Arithmetic with vectors*

Let

$$x_1 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \quad x_2 = \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}, \quad x_3 = \begin{bmatrix} 0 \\ -1 \\ 1 \end{bmatrix}$$

If

$$y = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix} = a_1x_1 + a_2x_2 + a_3x_3$$

where  $a_i$  are scalars, find  $a_3$ . **More advanced:** Observe that  $x_1$ ,  $x_2$ , and  $x_3$  form an orthogonal basis for  $\mathbb{R}^3$ . Give a simple procedure for finding  $a_3$  that leverages this fact.

Also, this course will heavily involve writing mathematical proofs and short answer solutions, as well as using programming and debugging skills in lab. If you are shaky in the above, we strongly encourage you to closely work with the professors, GSIs, and your study group to develop these skills.