

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

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

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

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

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.