MATH 1410 ASSIGNMENT #1
UNIVERSITY OF LETHBRIDGE, FALL 2016

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Due date: Thursday, September 29th, by 5 pm.

Please review the **Guidelines for preparing your assignments** before submitting your work. You can find these guidelines, along with the required cover page, in the Assignments section on our Moodle site.

Assigned problems.

(1) Show that for **any** complex numbers z and w, with $w \neq 0$, the complex modulus satisfies

$$\left|\frac{z}{w}\right| = \frac{|z|}{|w|}.$$

Hint: See page 39 of the textbook for an outline of the argument you should use. On this same page you'll find the proof that $|zw| = |z| \cdot |w|$, which might serve as a useful model for your own proof.

(2) Compute the following complex roots, and plot them in the complex plane.
(See Example 14 on page 47 of the text for guidance.)
   (a) Find the three cube roots of $z = -125$.
   (b) Find the six 6th roots of $z = 64$.

Note: The answers for 2(b) are in the back of the book. I'm more interested in seeing you work through the process than I am in the final answers.

(3) Let $\vec{v}$ and $\vec{w}$ be vectors in $\mathbb{R}^3$. In each case, either explain why the statement is true (in general), or give an example showing that it is false:
   (a) If $\|\vec{v} - \vec{w}\| = 0$, then $\vec{v} = \vec{w}$.
   (b) If $\vec{v} = -\vec{v}$, then $\vec{v} = \vec{0}$.
   (c) If $\|\vec{v}\| = \|\vec{w}\|$, then $\vec{v} = \vec{w}$.
   (d) If $\|\vec{v}\| = \|\vec{w}\|$, then $\vec{v} = \pm\vec{w}$.
   (e) $\|\vec{v} + \vec{w}\| = \|\vec{v}\| + \|\vec{w}\|$.

(4) Consider the triangle in $\mathbb{R}^3$ with vertices (corners) at the points

$$P = (2, 0, -3),\ Q = (5, -2, 1),\ \text{ and } R = (7, 5, 3).$$

Show that this is a right-angled triangle
   (a) Using dot products.
   (b) Using the Pythagorean Theorem.