Math 1XX3 Tutorial Problems

for T04, T07 with Mike

Tutorial 8/Week 9

Topics: Midterm 2 review. Dot and cross product. Polar coordinates. Power series, Taylor series.

1. If there are any questions (perhaps from the practice test, or just any other questions), we will start with those.

2. For vectors $\mathbf{t}$, $\mathbf{u}$, $\mathbf{v}$, and $\mathbf{w}$, which of the following expressions make sense? If not, explain why. If so, state whether the result is a vector or a scalar.

   (a) $\mathbf{u} \cdot (\mathbf{v} \times \mathbf{w})$
   (b) $\mathbf{u} \cdot (\mathbf{v} \cdot \mathbf{w})$
   (c) $(\mathbf{t} \cdot \mathbf{u}) \times (\mathbf{v} \cdot \mathbf{w})$
   (d) $(\mathbf{t} \times \mathbf{u}) \cdot (\mathbf{v} \times \mathbf{w})$

3. Compute the angle between the planes $2x + 4y - z = 5$ and $x - 4y - z + 2 = 0$.

4. Find the area of a triangle in $\mathbb{R}^2$ with vertices $(2, 0)$, $(3, 4)$, and $(-1, 2)$.

5. If the power series representation of $\ln(1 + x)$ is

$$\ln(1+x) = \sum_{n=1}^{\infty} (-1)^{n-1} \frac{x^n}{n} = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \cdots$$

   find the power series representation of

$$f(y) = \ln\left(\frac{11+y}{11-y}\right).$$

6. (a) Alice wants to show her love to Bob by sending him a valentine on her graphing calculator. Which of the following curves should Alice use to send Bob a picture of a heart?

   i. $r = 4\cos\theta$, ii. $r = 1 - \sin\theta$, iii. $r = \cos 3\theta$.

   (b) Bob responds by sending Alice a graph to show his love for her is infinite. Which equation does Bob need to use to get an infinity symbol? *[Hint: What is the domain?]*

   i. $r = \theta$ with $\theta \geq 0$, ii. $r = \frac{1}{2} + \sin\theta$, iii. $r^2 = \cos 2\theta$.