A2

Assessment 2
Dusty Wilson
Math 163

No work = no credit

Name: _____ _key_ _____

It appears to me that if one wishes to make progress in mathematics, one should study the masters and not the pupils.

Niels Henrik Abel
1802 - 1829 (Norwegian mathematician)

Warm-ups (1 pt each): $9+10=$ _19_ $-\dfrac{4}{0}=$ _undefined_ $-1^2=$ _-1_

Abel

1.) (1 pt) According to Ramsey (above), who should we learn from? Answer using complete English sentences.

We do well to learn only from the best/experts.

2.) (5 pts) If $\bar{u}=\langle 0,-3,4\rangle$ and $\bar{v}=\langle 2,-1,-2\rangle$ find the following:

a.) $|\bar{u}| = \sqrt{0^2+(-3)^2+4^2} = \sqrt{25} = 5$

b.) $5\bar{v} = 5\langle 2,-1,-2\rangle = \langle 10,-5,-10\rangle$

c.) $\bar{u}+\bar{v} = \langle 0,-3,4\rangle + \langle 2,-1,-2\rangle = \langle 2,-4,2\rangle$

d.) $\bar{u}-\bar{v} = \langle 0,-3,4\rangle - \langle 2,-1,-2\rangle = \langle -2,-2,6\rangle$

e.) $3\bar{u}+2\bar{v} = 3\langle 0,-3,4\rangle + 2\langle 2,-1,-2\rangle = \langle 4,-11,8\rangle$

3.) (2 pts) Find $\langle 1,-2,-1\rangle \cdot \langle -6,2,-3\rangle$

$= -6 + (-4) + 3$

$= -7.$

4.) (4 pts) Find a unit vector $\vec{v}$ in the direction of the vector from $P(1,0,1)$ to $Q(3,2,0)$.

$$\vec{PQ} = \langle 3,2,0 \rangle - \langle 1,0,1 \rangle = \langle 2,2,-1 \rangle$$

$$|\vec{PQ}| = \sqrt{4+4+1} = 3$$

$$\text{unit vector} = \frac{1}{3} \langle 2,2,-1 \rangle$$

5.) (4 pts) Find the angle between $\vec{a} = \vec{i} - 2\vec{j} - 2\vec{k}$ and $\vec{b} = 6\vec{i} + 3\vec{j} + 2\vec{k}$ (in radians).

$$\text{recall} \quad \vec{a} \cdot \vec{b} = |\vec{a}||\vec{b}| \cos\theta$$

$$\Rightarrow \theta = \cos^{-1}\left(\frac{\vec{a} \cdot \vec{b}}{|\vec{a}||\vec{b}|}\right)$$

$$= \cos^{-1}\left(-\frac{4}{21}\right)$$

$$\vec{a} \cdot \vec{b} = 6 + (-6) - 4$$
$$= -4$$

$$|\vec{a}| = \sqrt{1+4+4} = 3$$

$$|\vec{b}| = \sqrt{36+9+4} = 7$$

6.) (4 pts) Find the center and radius of the sphere $x^2 + y^2 + z^2 + 3x - 4z + 1 = 0$

complete the square.

$$\left(x^2 + 3x + \frac{9}{4}\right) + y^2 + \left(z^2 - 4z + 4\right) = -1 + 4 + \frac{9}{4}$$

$$\left(\frac{3}{2}\right)^2 = \frac{9}{4} \Rightarrow \left(x + \frac{3}{2}\right)^2 + y^2 + (z-2)^2 = \frac{21}{4}$$

center @ $\left(-\frac{3}{2}, 0, 2\right)$ w/ radius $\sqrt{\frac{21}{4}}$