Name_____ ID_____

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MATH 253 Quiz 1 Spring 2007

Sections 501-503 Solutions P. Yasskin

Multiple Choice & Work Out: (5 points each)

1. Find the equation of the sphere with center at $(4,3,2)$ which passes through the point $(2,4,0)$.

a. $(x+4)^2+(y+3)^2+(z+2)^2=\sqrt{3}$
b. $(x-4)^2+(y-3)^2+(z-2)^2=3$
c. $(x-4)^2+(y+3)^2+(z-2)^2=3$
d. $(x-4)^2+(y-3)^2+(z-2)^2=9$ Correct Choice
e. $(x+4)^2+(y-3)^2+(z+2)^2=9$

The vector from the center C to the point P is: $\overrightarrow{CP}=P-C=(-2,1,-2)$

The radius is the length of this vector: $R=\sqrt{2^2+1^2+2^2}=3$

The circle is: $(x-4)^2+(y-3)^2+(z-2)^2=9$

2. If $\vec{u}$ points South East and $\vec{v}$ points Down, then $\vec{u}\times\vec{v}$ points

a. South West
b. South East
c. Up
d. North West
e. North East Correct Choice

Point your right fingers South East with the palm facing Down, your thumb points North East.

3. A wagon is pulled horizontally from the origin $(0,0)$ to the point $(4,0)$ meters by the force $\vec{F}=(2,1)$ Newtons. Find the work done.

a. 8 Joules Correct Choice
b. 4 Joules
c. $4\sqrt{5}$ Joules
d. 12 Joules
e. $\frac{4}{\sqrt{5}}$ Joules

The displacement vector is $\vec{D}=(4,0)$. So the work is $W=\vec{F}\cdot\vec{D}=8$ Joules.

4. A triangle has vertices $P = (2,1,3)$, $Q=(2,4,0)$, and $R = (4,1,1)$.
Find the angle at P.

a. $30°$

b. $60°$ Correct Choice

c. $90°$

d. $120°$

e. $150°$

$\overrightarrow{PQ} = Q - P = (0,3,-3)$ $\overrightarrow{PR} = R - P = (2,0,-2)$

$\left|\overrightarrow{PQ}\right| = \sqrt{9+9} = 3\sqrt{2}$ $\left|\overrightarrow{PR}\right| = \sqrt{4+4} = 2\sqrt{2}$ $\overrightarrow{PQ} \cdot \overrightarrow{PR} = 6$

$\cos\theta = \frac{6}{3\sqrt{2}\,2\sqrt{2}} = \frac{1}{2}$ $\theta = 60°$ (Use a 30-60-90 triangle.)

5. A triangle has vertices $P = (2,1,3)$, $Q=(2,4,0)$, and $R = (4,1,1)$.
Find the area of the triangle. Solve this on the back of the Scantron. Show all work.

$\overrightarrow{PQ} = Q - P = (0,3,-3)$ $\overrightarrow{PR} = R - P = (2,0,-2)$

$$\overrightarrow{PQ} \times \overrightarrow{PR} = \begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ 0 & 3 & -3 \\ 2 & 0 & -2 \end{vmatrix} = \hat{\imath}(-6-0) - \hat{\jmath}(0--6) + \hat{k}(0-6) = (-6,-6,-6)$$

$A = \frac{1}{2}\left|\overrightarrow{PQ} \times \overrightarrow{PR}\right| = \frac{1}{2}\sqrt{36+36+36} = \frac{1}{2}6\sqrt{3} = 3\sqrt{3}$