

Merit Worksheet 3 - Math 242, Fall 2005

- Let $\underline{a} = 3\mathbf{i} + 7\mathbf{j} + 2\mathbf{k}$ and $\underline{b} = \mathbf{i} + 6\mathbf{j} + \mathbf{k}$ and $\underline{c} = 4\mathbf{i} - 7\mathbf{j} + 2\mathbf{k}$
 - Calculate $\underline{a} \cdot \underline{b} + \underline{a} \cdot \underline{c}$.
 - Calculate $(\underline{a} + \underline{b}) \cdot \underline{c}$.
 - Calculate $(2\underline{a}) \cdot \underline{b}$, $2(\underline{a} \cdot \underline{b})$.
 - Prove these patterns always hold.
- Use $\underline{a} \cdot \underline{a} = \|\underline{a}\|^2$ to find $\|\underline{x} - \underline{y}\|^2$ in terms of $\|\underline{x}\|$, $\|\underline{y}\|$ and $\underline{x} \cdot \underline{y}$.
 - Let θ be the angle between \underline{x} and \underline{y} . Use the cosine rule to find $\|\underline{x} - \underline{y}\|^2$.
 - Show that $\underline{x} \cdot \underline{y} = \|\underline{x}\| \|\underline{y}\| \cos \theta$.
- Find the angle θ between the following pairs of vectors:
 - $12\mathbf{i} + 3\mathbf{j} - 4\mathbf{k}$ and $8\mathbf{i} - 15\mathbf{j}$.
 - $-4\mathbf{i} + 3\mathbf{j}$ and $5\mathbf{i} - 12\mathbf{j}$.
- Find the angle between $\underline{x} = 6\mathbf{i} - 2\mathbf{j} + 3\mathbf{k}$ and
 - the x -axis.
 - the y -axis.
 - Find the unit vector $\frac{\underline{x}}{\|\underline{x}\|}$.
 - Quickly say what the angle between \underline{x} and the z -axis is. Explain.
- Find the angles between $-2\mathbf{i} + 3\mathbf{j} + 2\sqrt{3}\mathbf{k}$ and the x -, y -, and z -axes.
- Draw suitable triangles and use these to calculate \sin , \cos , and \tan of 30° , 45° , 60° . (You should also know these for 0° , 90° - sketch the graphs of $\sin x$, $\cos x$, $\tan x$.)
- You will be at a real disadvantage in this course if you do not remember basic differentiation and integration. See whether you need to revise that material.
 - $\frac{d}{dx} (x^3 \sin^2 2x)$

$$(b) \frac{d}{dx} \left(\frac{4x^2}{1+2x} \right)$$

8. (a) $\int_0^{3\pi} x \sin x dx$

(b) $\int_1^5 \frac{\log x}{x} dx$

(c) $\int_{-\pi}^{\pi} \cos x e^{\sin x} dx$

(d) $\int \sqrt{4-x^2} dx$

Warm-Up Problems for Tuesday

Let $\underline{a} = 3\mathbf{i} + 7\mathbf{j} + 2\mathbf{k}$ and $\underline{b} = \mathbf{i} + 6\mathbf{j} + \mathbf{k}$ and $\underline{c} = 4\mathbf{i} - 7\mathbf{j} + 2\mathbf{k}$.

1. Calculate $\underline{a} \times \underline{b}$ and $\underline{a} \times \underline{c}$.

2. Calculate $(\underline{a} \times \underline{b}) \cdot \underline{a}$.