Fall 2009 Math 151

Week in Review II

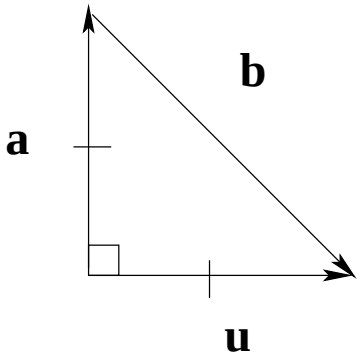
courtesy: David J. Manuel

(covering 1.2, 1.3 and 2.2)

1 Section 1.2

1. Find $\mathbf{a} \cdot \mathbf{b}$ if $\mathbf{a} = < 1, -1 >$ and $\mathbf{b} = \mathbf{i} + 2\mathbf{j}$.

2. Find $\mathbf{a} \cdot \mathbf{b}$ for the figure below, given $\mathbf{u}$ is a unit vector



3. Find the angle between the vectors $< 3, 1 >$ and $-2\mathbf{i} + 4\mathbf{j}$.

4. Find x such that the vectors $x\mathbf{i} + \mathbf{j}$ and $(4 + x)\mathbf{i} + 3\mathbf{j}$ are orthogonal.

5. Given $\mathbf{a} =< 4, 5 >$ and $\mathbf{b} =< 1, -2 >$ find the scalar and vector projections of:
   a) $\mathbf{b}$ onto $\mathbf{a}$
   b) $\mathbf{a}$ onto $\mathbf{b}$

6. A 10-kg block slides down a ramp which is 5m tall and 8m long. Find the work done by gravity if the block slides (friction-free) all the way down the ramp.

7. Find the distance from the point $(1, 5)$ to the line $2x - 3y = 12$.

2 Section 1.3

1. Find the Cartesian equation of the curve parametrized by $x = \sqrt{t}$, $y = 2t + 4$ and sketch the graph.

2. Given $\mathbf{r}(t) = (t^{1/2} + 1)\mathbf{i} + t^{3/2}\mathbf{j}$:
   a) Find $\mathbf{r}(1)$ and $\mathbf{r}(t + h)$
   b) When (if at all) does the graph pass through the point $(3, 8)$?
   c) Eliminate the parameter and sketch the graph.

3. Describe the motion of a particle whose position is given by $x = -4\cos t$, $y = 3\sin t$.

4. Find vector and parametric equations of the line passing through the points $(-4, 2)$ and $(2, 14)$.

5. Determine whether the lines $\mathbf{r_1}(t) = (3 - 4t)\mathbf{i} + (4 + 3t)\mathbf{j}$ and $\mathbf{r_2}(t) = (2 - 5t)\mathbf{i} + (5 - 3t)\mathbf{j}$ are parallel, perpendicular, or neither. If not parallel, find their point of intersection.

6. A water balloon is thrown with initial velocity of 15 meters per second at an angle of elevation of 30°. Soon you will be able to derive the following parametric equations for the motion of the balloon: $x = \frac{15\sqrt{3}}{2}t$, $y = \frac{15}{2}t - 4.9t^2$. Determine how far away the balloon will strike the ground and find the Cartesian equation for the balloon's motion.

7. How, if at all, does the graph of the function $\mathbf{r}(t) = t\mathbf{i} + (t-1)^3\mathbf{j}$ differ from the graph of #2?

3 Section 2.2

1. Use a computational device to estimate $\lim_{x \to 0} \dfrac{2^x - 1}{x}$.

2. Determine $\lim_{x \to 1} \dfrac{x^2 + 1}{x - 1}$ or show the limit Does Not Exist.

3. Determine $\lim_{x \to 3} \dfrac{x^2 + 1}{(x-3)^2}$ or show the limit Does Not Exist.

4. Find the vertical asymptotes of $f(x) = \dfrac{x^2 - 4}{(x-1)(x-2)(x-3)(x-4)}$.