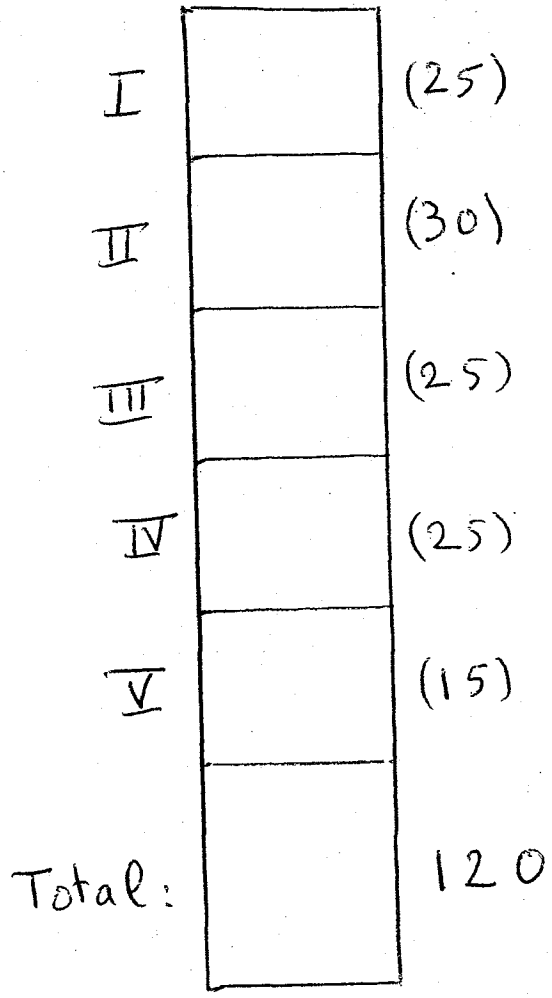
Math 113 **EXAM III, April 26th, 2007,** (50 minutes).

NAME: SECTION: Instructor:

TO RECEIVE CREDIT FOR AN ANSWER,
YOU MUST SHOW WORK JUSTIFYING THAT ANSWER.



Total for the 3 midterms:

I. (NO CALCULATOR, and do not forget to provide full justification)

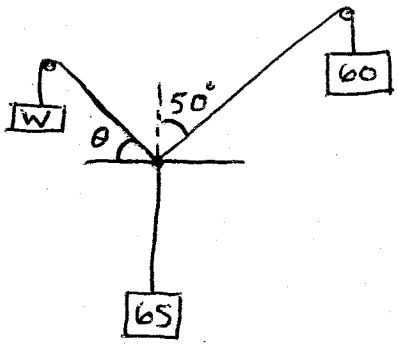
(25 points)

Find an angle α such that:

$$\sin^2 \alpha = 1 - \cos^2 7^\circ \text{ and } 180^\circ < \alpha < 270^\circ .$$

II. (30 points)

Find the weight W and the angle θ in order that the figure shows an equilibrium.



III. NO CALCULATOR. (25 points)

Let $\vec{U}$ =<3,7> and $\vec{V}$ =<2,-1>. On the figure, show the vectors $\vec{U}$, $\vec{V}$, $\vec{U}+\vec{V}$, and $\vec{V}-\vec{U}$. Evaluate the lengths, $|\vec{U}|$ and $|\vec{V}|$ of the vectors $\vec{U}$ and $\vec{V}$, and evaluate the dot product $\vec{U}\cdot\vec{V}$.

Give the EXACT value of the cosine of the angle α between the vectors $\vec{U}$ and $\vec{V}$ (geometric angle in the range from 0^o to 180^o, with no orientation taken into account). Without calculator can you say whether this is an acute or an obtuse angle?

IV. (25 points)

Let z and z' be the complex numbers $z = 3+7i$ and $z' = 2-i$. Evaluate $z+z'$, zz' and $\frac{z}{z'}$ in Cartesian form (i.e. $a+bi$). If $\frac{z}{z'} = r(\cos\theta + i\sin\theta)$ is the writing of $\frac{z}{z'}$ in polar (i.e. trigonometric) form, with $r > 0$ and $-\pi < \theta \leq \pi$, give the EXACT values for r, $\cos\theta$ and $\sin\theta$. No Calculator, you are not asked the exact value of θ. On the figure of Problem III, show the angle θ with its orientation. Using your calculator, give an approximate value of θ (in radians).

------ ANSWERS ----------

$z+z' =$ $zz' =$

$\frac{z}{z'} =$

$r =$, $\cos\theta =$, $\sin\theta =$

$\theta \simeq$ radians.

V. Prove that the following figure is not possible: (15 points)