

Math 113

EXAM III, Nov 30, 2006, (50 minutes).

NAME:

SECTION:

Instructor:

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

I	II	III	IV	Total
30	40	25	25	120

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

(30 points)

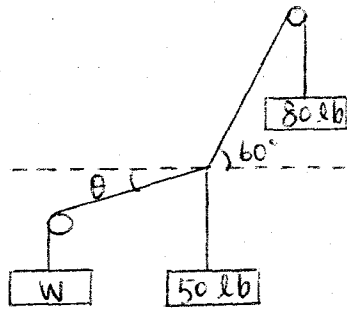
Find an angle α such that:

$$\sin^2 \alpha = 1 - \cos^2 57^\circ \quad \text{and} \quad -180^\circ < \alpha < -90^\circ .$$

II.

(40 points)

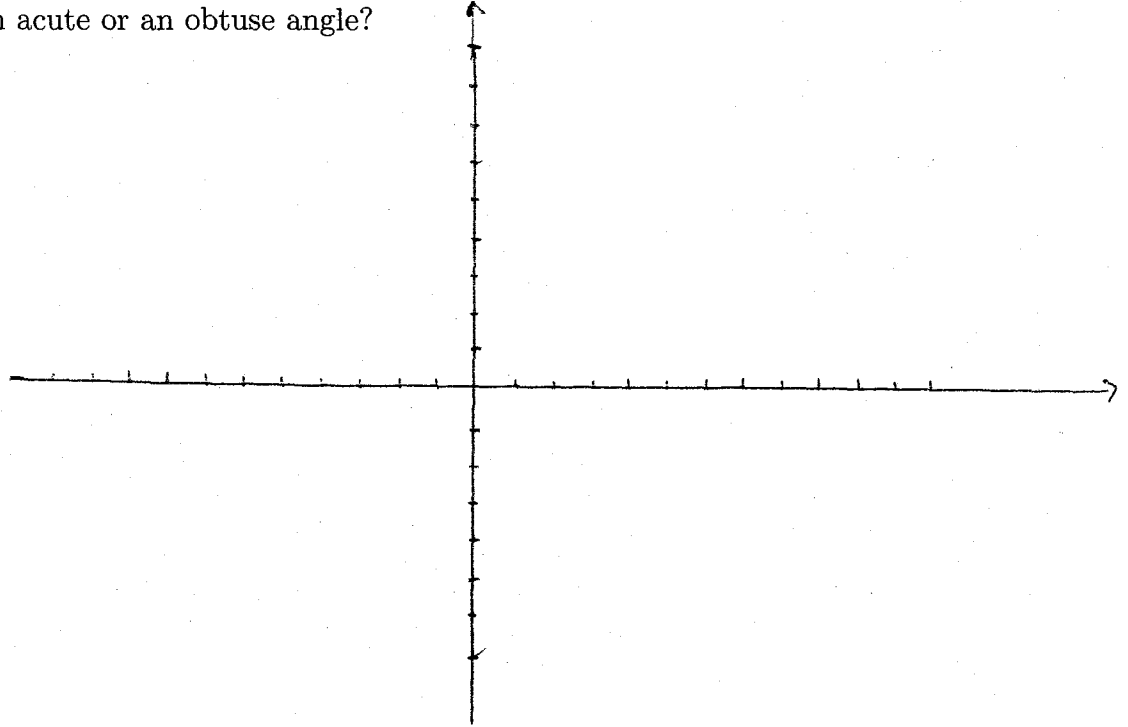
Find the weight W and the angle θ in order that the figure shows an equilibrium.



III. NO CALCULATOR.

(25 points)

Let $\vec{U} = \langle 3, -2 \rangle$ and $\vec{V} = \langle 5, 7 \rangle$. 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} . 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° to 180° , 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 $z = 3 - 2i$ and $z' = 5 + 7i$. 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).