Name ________________________________ Honors Pre-Calculus Test

February 28, 2002 Sections 6.1–6.3

1. **a.** $\langle -3, 2\rangle$

b. $\sqrt{13} \approx 3.61$.

c. 2.554 radians or 146.31°. (If you answered –33.69°, you chose an angle in opposite direction. Note that the vector goes up and left, not down and right. So add 180°.)

d. One possible answer: $R = (0, 0)$, $S = (-3, 2)$.

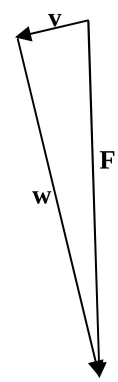
2. **a.** One possible answer:

$x = 2 - 3t$,
$y = 3 + 2t$.

b. One possible answer:

$x = 2 + 3 \cos t$,
$y = -4 + 3 \sin t$.

3. **a.** $\mathbf{F} = \langle 0, -6000\rangle$.



b. See diagram at the right. $\mathbf{F} = \mathbf{v} + \mathbf{w}$ where vector $\mathbf{v}$ is parallel to the hill and vector $\mathbf{w}$ is perpendicular to the hill. The triangle's angles are 10°, 80°, and 90°.

c. Answer: $\langle -1026.06, -180.92\rangle$. *One method:* Use the projection formula to find the projection of **F** in the direction of the hill. *Another method:* Find the answer to part **d** first, then multiply –1041.89 by $\langle \cos 10°, \sin 10°\rangle$.

d. Use right triangle trig. to find the length of side **v**. Answer: 1041.89 pounds.

4. $\mathbf{v} \cdot \mathbf{v} = |\,\mathbf{v}\,|^2$. ***Proof:***

$\mathbf{v} \cdot \mathbf{v} = \langle v_1, v_2\rangle \cdot \langle v_1, v_2\rangle = v_1v_1 + v_2v_2 = v_1^2 + v_2^2$

$|\,\mathbf{v}\,|^2 = \left(\sqrt{v_1^2 + v_2^2}\right)^2 = v_1^2 + v_2^2$

So $\mathbf{v} \cdot \mathbf{v} = |\,\mathbf{v}\,|^2$.

5. **a.** See the diagram on page 491. (You can also see the proof itself on page 492.)

b. From the Law of Cosines applied to the triangle:

$$|\,\mathbf{v} - \mathbf{u}\,|^2 = |\,\mathbf{u}\,|^2 + |\,\mathbf{v}\,|^2 - 2\,|\,\mathbf{u}\,|\,|\,\mathbf{v}\,| \cos \theta$$

c. $\cos \theta = \dfrac{-63}{5 \cdot 13}$, so $\theta \approx 2.893$ radians or 165.75°.

6. **a.** $\langle 30 \cos 65°, 30 \sin 65°\rangle \approx \langle 12.68, 27.19\rangle$.

b. $t = 0.85$ sec, $x = 10.77$ feet, $y = 17.55$ feet.

If you had trouble finding the values accurately because the calculator doesn't offer [2nd][Calc]maximum in parametric mode, try graphing the relationship between t and y using rectangular mode instead, in which you can get the maximum point (t, y).