Section 7.8
Solutions and Hints

by Brent M. Dingle

for the book:
Precalculus, Mathematics for Calculus 4th Edition
by James Stewart, Lothar Redlin and Saleem Watson.

Some useful equations from this section:

Angle, θ, between two nonzero vectors: $\mathbf{u} \bullet \mathbf{v} = |\mathbf{u}| * |\mathbf{v}| * \cos(\theta)$

Orthogonal Test: Two nonzero vectors are perpendicular iff $\mathbf{u} \bullet \mathbf{v} = 0$

Components: The component of **u** along **v** is: $(\mathbf{u} \bullet \mathbf{v}) / | v |$

Work: $W = \mathbf{F} \bullet \mathbf{D}$ (work = force vector dot distance vector)

34. A constant force F = <2, 8> moves an object along a straight line from the point (2, 5) to point (11, 13). Find the work done if the distance is measured in feet and the force is measured in pounds.

$\mathbf{D} = < 11-2, 13 - 5 > = < 9, 8 >$

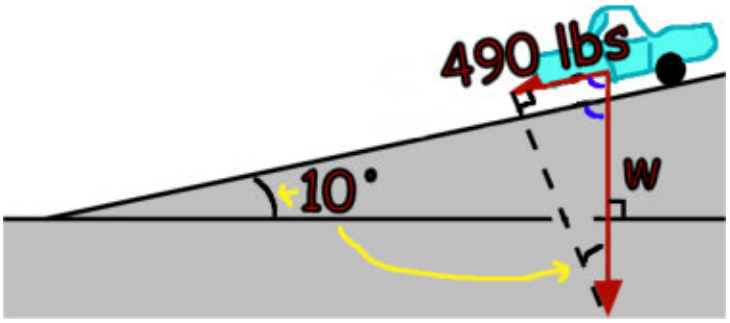
$W = \mathbf{F} \bullet \mathbf{D} = <2, 8> \bullet <9, 8>$
$= 2*9 + 8*8$
$= 18 + 64 = \mathbf{82 \text{ ft. lbs}}$

38. A car is on a driveway that is inclined 10° to the horizontal. A force of 490 lbs is required to keep the car from rolling down the driveway.

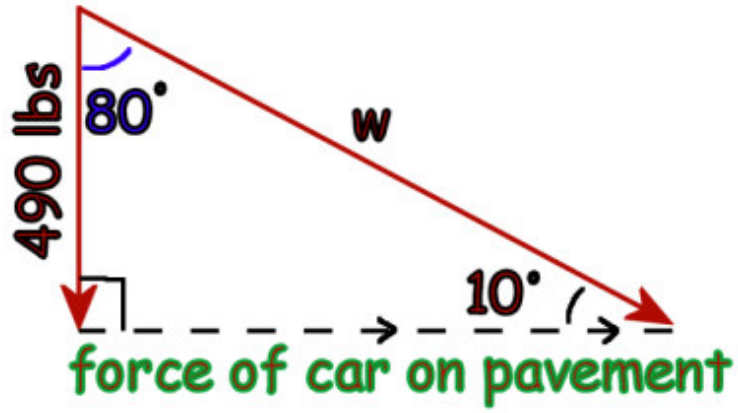
38a. Find the weight of the car.

What this question in saying is that because of the car's weight there is a force of 490 lbs pulling the car down the incline (thus a force of 490 lbs up the incline is required to keep it from moving – this in real life is accomplished by frictional forces, not important here).

To solve this problem we will use triangles (surprised? =)



From the above picture we get the picture we really need for this problem:



Where w = weight of the car and the dashed horizontal line will equal the force of the car on the surface of the driveway. So from the above picture we see:

$\cos(80°) = \text{adj/hyp} = 490/w \rightarrow w = 490/\cos(80°)$

$\rightarrow$ **$w \cong 2822$ lbs**.

38b. Find the force the car exerts against the driveway. (this is the force perpendicular to the driveway)

Let F = |**F**| = force of the car on the driveway

By property of a right triangle $F^2 + 490^2 = w^2 = 2822^2$ $\rightarrow F^2 = 7963684 - 240100$

$\rightarrow F \cong$ **2779 lbs**

(or $\tan(10°) = 490/F \rightarrow F = 490/\tan(10°) \rightarrow F \cong 2779$ lbs)