Vectors in $\Re^2$
Work

(1) ***Let $\overline{u}$ = <1,1>, $\overline{v}$ = <–2,6>, $\overline{w}$ = <4,2>***

(1a) Find $\overline{u} - \overline{v}$

(1b) Find $3(\overline{u} - \overline{v})$

(1c) Find $\overline{u} + \overline{w}$

(1d) Find $\frac{-1}{2}(\overline{u} + \overline{w})$

(1e) Find $3(\overline{u} - \overline{v}) - \frac{1}{2}(\overline{u} + \overline{w})$

Vectors in $\Re^2$
Work

(2) Let A(2,5), B(1,6) and C(1,1)

(2a) Sketch ΔABC

(2b) Find the components of $\overline{AB}$ and $\overline{AC}$

(2c) Find the dot product $\overline{AB} \bullet \overline{AC}$

(2d) Find $m\angle BAC$ in degrees using the dot product

(2e) Find area of ΔABC using $\angle BAC$

Vectors in $\Re^2$
Work

(3) A tractor pulls a log 2500 feet and the tension in the cable connecting the tractor and log is 3600 pounds. Find the work done by the tractor if the force is 35° above the horizontal.

(3a) Draw a free body diagram with the log dragged along a horizontal surface.

(3b) Express $\overline{\mathrm{F}}$ in polar form.

(3c) Express $\overline{\mathrm{d}}$ in polar form.

(3d) Find the dot product $\overline{\mathrm{F}} \bullet \overline{\mathrm{d}}$ using the polar form vectors.

(3e) What is the work done and what are the units?

Vectors in $\Re^2$
Work

(4) A car pulls a trailer 200 meters and the tension in the cable connecting the tractor and log is 600 newtons. Find the work done by the car if the force is $\frac{\pi}{6}$ above the horizontal.

(4a) Draw a free body diagram with the trailer pulled along a horizontal road.

(4b) Express $\overline{\text{F}}$ in Cartesian form.

(4c) Express $\overline{\text{d}}$ in Cartesian form.

(4d) Find the dot product $\overline{\text{F}} \bullet \overline{\text{d}}$ using the Cartesian form vectors.

(4e) What is the work done and what are the units?

Vectors in $\Re^2$
Work

(5) ***Let $W = \overline{F} \bullet \overline{s}$.***

(5a) Find $\frac{dW}{dt}$ using the product rule of differentiation in terms of any $\overline{F}$ and $\overline{s}$.

(5b) Given a specific $\overline{F} = \langle 2t, t^2 \rangle$ newtons and a specific $\overline{s} = \langle 3, \frac{t}{2} \rangle$ meters, find W(t).

Vectors in $\Re^2$
Work

(5c) Calculate W(t) when t = 1 sec.

(5d) Calculate $\frac{dW}{dt}$ when t = 1 sec.

Vectors in $\Re^2$
Work

(5e) What is the physical significance of W(t)? What is the physical significance of $\frac{dW}{dt}$?

Vectors in $\Re^2$
Work

(6) ***Let $W = \int \overline{F} \bullet d\overline{s}$***

Let $\overline{F} = 6x\,\overline{i} - 2y\,\overline{j}$ pounds

Let $d\overline{s} = dx\,\overline{i} + dy\,\overline{j}$ feet

(6a) Find $\overline{\mathrm{F}} \bullet \mathrm{d}\overline{\mathrm{s}}$.

(6b) Find $\int \overline{\mathrm{F}} \bullet \mathrm{d}\overline{\mathrm{s}}$.

Vectors in $\Re^2$
Work

(6c) Calculate $\int \overline{F} \bullet d\overline{s}$ in the x direction as x varies from 0 to 5ft.

(6d) Calculate $\int \overline{F} \bullet d\overline{s}$ in the y direction as y varies from 0 to 5ft.

Vectors in $\Re^2$
Work

(6e) How is this process for calculating W different than that of question (5)? Which is preferable when $\overline{\text{F}}$ is not a constant? Why?

Vectors in $\Re^2$
Work

Teacher lectures based on Larson PreCalculus © 1994
section 11.1 (Vectors in $\Re^2$) and
section 11.2 (Dot Product)