Student: _____ **Date:** _____	**Instructor:** Joe Betters **Course:** Pre-Calculus Pre AP (Master Course)	**Assignment:** 9.5 Classwork Day 1

1. Given $\mathbf{v} = -\mathbf{i} - \mathbf{j}$ and $\mathbf{w} = -\mathbf{i} + \mathbf{j}$
   (a) find the dot product $\mathbf{v} \cdot \mathbf{w}$;
   (b) find the angle between $\mathbf{v}$ and $\mathbf{w}$;
   (c) state whether the vectors are parallel, orthogonal, or neither.

   (a) $\mathbf{v} \cdot \mathbf{w} =$ _____

   (b) What is the angle between $\mathbf{v}$ and $\mathbf{w}$?

   _____ ° (Do not round until the final answer. Then round to the nearest tenth as needed.)

   (c) Are vectors $\mathbf{v}$ and $\mathbf{w}$ parallel, orthogonal, or neither?

   ○ neither ○ orthogonal ○ parallel

   ID: 9.5.7

2. Find a so that the vectors $\mathbf{v} = \mathbf{i} - a\mathbf{j}$ and $\mathbf{w} = 9\mathbf{i} - 10\mathbf{j}$ are orthogonal.

   $a =$ _____ (Type an integer or a simplified fraction.)

   ID: 9.5.17

3. Decompose $\mathbf{v}$ into two vectors, $\mathbf{v}_1$ and $\mathbf{v}_2$, where $\mathbf{v}_1$ is parallel to $\mathbf{w}$ and $\mathbf{v}_2$ is orthogonal to $\mathbf{w}$.

   $\mathbf{v} = \mathbf{i} - 5\mathbf{j}$, $\mathbf{w} = 2\mathbf{i} + \mathbf{j}$

   $\mathbf{v}_1 =$ (_____)$\mathbf{i} +$ (_____)$\mathbf{j}$ $\mathbf{v}_2 =$ (_____)$\mathbf{i} +$ (_____)$\mathbf{j}$
   (Simplify your answer.)

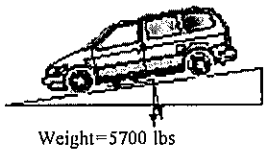
   ID: 9.5.21

4. Find the work W done by a force of 7 pounds acting in the direction 30° to the horizontal in moving an object 8 feet from (0,0) to (8,0).

   $W =$ _____ foot-pounds
   (Round to the nearest whole number as needed.)

   ID: 9.5.25

5. A minivan with a gross weight of 5700 pounds is parked on a street with a slope of 9°. Find the force required to keep the vehicle from rolling down the hill. What is the force perpendicular to the hill?



What is the force required to keep the vehicle from rolling down the hill?

_____ pounds (Round to one decimal place as needed.)

What is the force perpendicular to the hill?

_____ pounds (Round to one decimal place as needed.)

ID: 9.5.29

1. 0

   90

   orthogonal

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2. $-\frac{9}{10}$

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3. $-\frac{6}{5}$

   $-\frac{3}{5}$

   $\frac{11}{5}$

   $-\frac{22}{5}$

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4. 48

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5. 891.7

   5629.8

9.5 classwork day 1

① $v = -i - j$

$w = -i + j$

a) $v \cdot w = (-1)(-1) + (-1)(1) = \boxed{0}$ orthogonal if dot product is 0

b) $\cos\theta = \dfrac{v \cdot w}{\|v\|\|w\|} = \dfrac{0}{\sqrt{2}\sqrt{2}} = 0$

$\boxed{\theta = 90^\circ}$

c) $\boxed{\text{orthogonal}}$ $\theta = 90^\circ$

② $v = i - aj$

$w = 9i - 10j$

Find a so vectors are orthogonal

$(1)(9) + (-a)(-10) = 0$

$9 + 10a = 0$

[redacted]

$\boxed{a = -\dfrac{9}{10}}$

9.5 classwork continued day 1

③ Decompose where v_1 parallel, v_2 orthogonal

$v = i - 5j$

$w = 2i + j$

$$v_1 = \frac{v \cdot w}{\|w\|^2} w = \frac{(1)(2)+(-5)(1)}{(\sqrt{5})^2}(2i + j)$$

$$v_1 = -\frac{3}{5}(2i + j)$$

$$\boxed{v_1 = -\frac{6}{5}i - \frac{3}{5}j}$$

$$v_2 = v - v_1 = (i - 5j) - \left(-\frac{6}{5}i - \frac{3}{5}j\right)$$

$$\boxed{v_2 = \frac{11}{5}i - \frac{22}{5}j}$$

9.5 classwork day 1 continued

④ force 7 pounds

30° to horizontal

moving 8 feet from (0,0) to (8,0)

$$F = 7(\cos 30\,i + \sin 30\,j)$$

$$F = 7\left(\frac{\sqrt{3}}{2}i + \frac{1}{2}j\right)$$

$$F = \frac{7\sqrt{3}}{2}i + \frac{7}{2}j$$

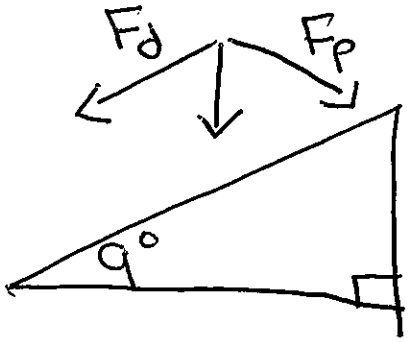
$$W = F \cdot \overrightarrow{AB} \qquad \text{dot product}$$

$$W = \left(\frac{7\sqrt{3}}{2}i + \frac{7}{2}j\right) \cdot (8i + 0j)$$

$$W = \left(\frac{7\sqrt{3}}{2}\right)(8) + \left(\frac{7}{2}\right)(0)$$

$$W = \boxed{48 \text{ foot-pounds}} \quad \underline{\text{rounded}}$$

9.5 classwork day 1 continued



⑤ 5700 pounds

9° slope

Downhill

$F_d = F \sin\theta$

$F_d = 5700 \sin 9°$

$F_d = \boxed{891.7}$

Perpendicular

$F_p = F \cos\theta$

$F_p = 5700 \cos 9$

$F_p = \boxed{5629.8}$