B.4.6) PROJECTION OF A FORCE ON A LINE

The projection of **F** onto line *AB* is given by the dot product of **F** with the unit vector in the direction of line *AB* is given by Equation B.4-7.

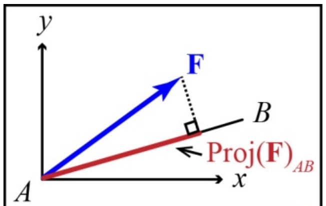

Figure B.4-5: Projection of a vector

Projection of a vector: $$\text{Proj}(\mathbf{F})_{AB} = \mathbf{F}\cdot\mathbf{u}_{AB}$$ (B.4-7)

Solved Example B.4-3

A plane contains the vectors **A** and **B**. Determine the projection of **A** onto **B**.

$\mathbf{A} = 4\mathbf{i} - 2\mathbf{j} + 3\mathbf{k}$ $\qquad$ $\mathbf{B} = -2\mathbf{i} + 6\mathbf{j} - 5\mathbf{k}$

$$\text{Proj}(\mathbf{A})_B = \mathbf{A}\cdot\mathbf{u}_B = (4\mathbf{i} - 2\mathbf{j} + 3\mathbf{k})\cdot\left(\frac{-2\mathbf{i} + 6\mathbf{j} - 5\mathbf{k}}{\sqrt{2^2 + 6^2 + 5^2}}\right)$$
$$= (4\mathbf{i} - 2\mathbf{j} + 3\mathbf{k})\cdot(-0.248\mathbf{i} + 0.744\mathbf{j} - 0.62\mathbf{k})$$
$$= -4.34$$

B.5) CALCULUS - DIFFERENTIATION

Calculus can be used to help solve most engineering problems, particularly those that have rate of change concepts. Another common use is to find the maximum or minimum values of a function.

B.5.1) THE SLOPE OF A LINE AND A FUNCTION

B.5.1.1) Slope of a line

The slope (m) of the line shown in Figure B.5-1 is given by Equation B.5-1 and the equation of the line is given by Equation B.5-2.

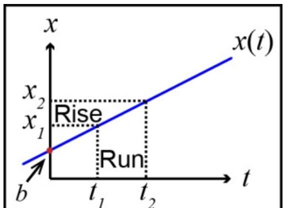

Figure B.5-1: Slope of a line

Slope: $$m = \frac{\text{rise}}{\text{run}} = \frac{(x_2 - x_1)}{(t_2 - t_1)}$$ (B.5-1)

Equation of a line: $$x = mt + b$$ (B.5-2)

m = slope of the line
b = y-intercept
t = time