

In[78]:= **InnerProduct = DotProduct**

Out[78]= DotProduct

In[79]:= **? InnerProduct**

Global`InnerProduct

InnerProduct = DotProduct

In[80]:= **? DotProduct**

Global`DotProduct

DotProduct[u\_, v\_] :=  $\sum_{i=1}^{\text{Length}[u]} u[[i]] v[[i]]$

In[81]:= **VectorLength[{1, 2, 3}]**

Out[81]=  $\sqrt{14}$

In[82]:= **ScalarProduct = RealVectorScalarProduct**

Out[82]= RealVectorScalarProduct

In[83]:= **VectorSum = RealVectorSum**

Out[83]= RealVectorSum

In[84]:= **VectorSum[{1, 2, 3}, {10, 20, 30}]**

Out[84]= {11, 22, 33}

In[85]:= **v[1] = {1, 2, 3}; v[2] = {10, 20, 30}; v[3] = {3, 4, 5};**

In[86]:= **B = N[OrthonormalBasis[{v[1], v[2], v[3]}]]**

Out[86]= {{0.267261, 0.534522, 0.801784}, {0.872872, 0.218218, -0.436436}}

In[87]:= **B**

Out[87]= {{0.267261, 0.534522, 0.801784}, {0.872872, 0.218218, -0.436436}}

In[88]:= **B[[1]]**

Out[88]= {0.267261, 0.534522, 0.801784}

In[89]:= **B[[2]]**

Out[89]= {0.872872, 0.218218, -0.436436}

In[90]:= **VectorLength[B[[1]]]**

Out[90]= 1.

In[91]:= **VectorLength[B[[2]]]**

Out[91]= 1.

In[92]:= **InnerProduct[B[[1]], B[[2]]]**

Out[92]= 0.

In[93]:= **c[1] = {1, 1, 1, 1}; c[2] = {1, 2, 3, 4}; c[3] = {1, 4, 9, 16};**

In[94]:= **B = Simplify[OrthonormalBasis[{c[1], c[2], c[3]}]]**

Out[94]=  $\left\{ \left\{ \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2} \right\}, \left\{ -\frac{3}{2\sqrt{5}}, -\frac{1}{2\sqrt{5}}, \frac{1}{2\sqrt{5}}, \frac{3}{2\sqrt{5}} \right\}, \left\{ \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2} \right\} \right\}$

In[95]:= **y = {1, 3, 8, 50};**

In[96]:= **yp = Simplify[ProjectionVector[y, B]]**

Out[96]=  $\left\{ \frac{27}{10}, -\frac{21}{10}, \frac{131}{10}, \frac{483}{10} \right\}$

In[97]:= **Solve[yp = a \* c[1] + b \* c[2] + cc \* c[3], {a, b, cc}]**

Out[97]=  $\left\{ \left\{ a \rightarrow \frac{55}{2}, b \rightarrow -\frac{174}{5}, cc \rightarrow 10 \right\} \right\}$

In[98]:= **dataSet = {{1, 1}, {2, 3}, {3, 8}, {4, 50}}**

Out[98]=  $\left\{ \{1, 1\}, \{2, 3\}, \{3, 8\}, \{4, 50\} \right\}$

In[99]:= **Show[ListPlot[dataSet, PlotStyle -> PointSize[.02]],  
Plot[(55/2) - (174/5) x + 10 x^2, {x, 0, 5}, PlotStyle -> Red]**

