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> ##### T2 Turma 3ZA #####
##### QUESTAO 1 #####
restart: with(linalg): with(LinearAlgebra): with(plots): Digits:=7:
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```
> A:=VandermondeMatrix([0.00,0.25,0.50,0.75,1.00],5,3);
b:=vector([1.000,1.2840,1.6487,2.1170,2.7183]);
```

$$A := \begin{bmatrix} 1 & 0 & 0 \\ 1.0 & 0.25 & 0.0625 \\ 1.0 & 0.50 & 0.2500 \\ 1.0 & 0.75 & 0.5625 \\ 1.0 & 1.00 & 1.0000 \end{bmatrix}$$

$$b := \begin{bmatrix} 1.000 & 1.2840 & 1.6487 & 2.1170 & 2.7183 \end{bmatrix}$$

(1)

```
> v:=leastsqrs(A,b);
```

$$v := \begin{bmatrix} 1.005135 & 0.8641980 & 0.8436429 \end{bmatrix}$$

(2)

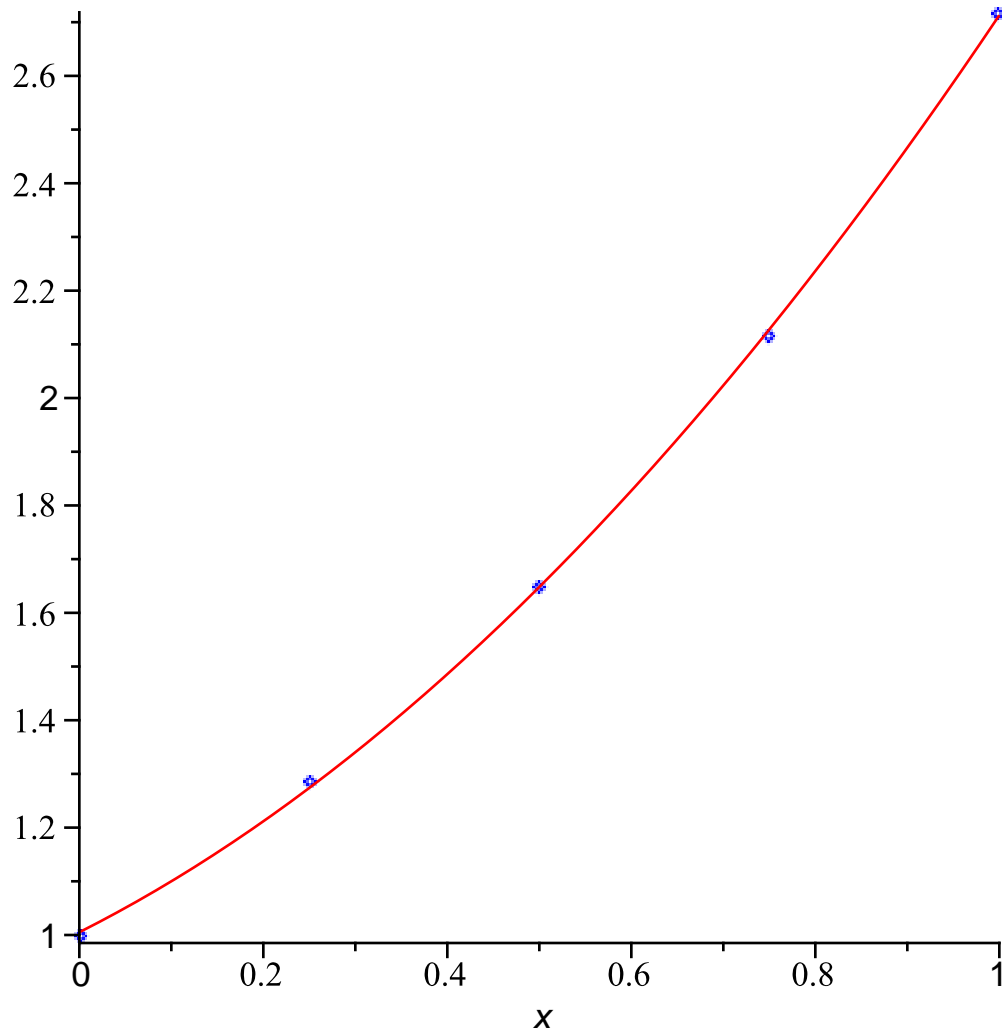
```
> p:=x->v[3]*x^2+v[2]*x+v[1];
p(x);
```

$$p := x \rightarrow v_3 x^2 + v_2 x + v_1$$

$$0.8436429 x^2 + 0.8641980 x + 1.005135$$

(3)

```
> x:=vector([0.00, 0.25 ,0.50, 0.75 ,1.00]):
u:=[seq([x[i],b[i]],i=1..5)]:
U:=listplot(u,style=point,color=blue):
P:=plot(p(x),x=0.0..1.0,color=red,thickness=1):
display(U,P);
```



```
> #####QUESTAO 2 #####
restart:with(linalg):
> v1:=vector([4,2,0,4]);
v2:=vector([7,3,5,2]);
B:=augment(v1,v2);
A:=evalm(transpose(B));
# O espaco-linha de A eh igual a S por construcao. O complemento
ortogonal de S eh portanto o espaco-nulo de A.
```

$$v1 := \begin{bmatrix} 4 & 2 & 0 & 4 \end{bmatrix}$$

$$v2 := \begin{bmatrix} 7 & 3 & 5 & 2 \end{bmatrix}$$

$$B := \begin{bmatrix} 4 & 7 \\ 2 & 3 \\ 0 & 5 \\ 4 & 2 \end{bmatrix}$$

$$A := \begin{bmatrix} 4 & 2 & 0 & 4 \\ 7 & 3 & 5 & 2 \end{bmatrix} \quad (4)$$

```
> # (a)
GramSchmidt({v1,v2},normalized);
```

$$\left\{ \left[ \begin{array}{cccc} \frac{2}{3} & \frac{1}{3} & 0 & \frac{2}{3} \end{array} \right], \left[ \begin{array}{cccc} \frac{7}{114} \sqrt{38} & \frac{1}{57} \sqrt{38} & \frac{5}{38} \sqrt{38} & -\frac{4}{57} \sqrt{38} \end{array} \right] \right\} \quad (5)$$

```
> # (b)
nullspace(A);
w1:=vector([-5,10,1,0]);
w2:=vector([4,-10,0,1]);
simplify(GramSchmidt({w1,w2},normalized));
```

$$\left\{ \left[ \begin{array}{cccc} -5 & 10 & 1 & 0 \end{array} \right], \left[ \begin{array}{cccc} 4 & -10 & 0 & 1 \end{array} \right] \right\}$$

$$w1 := \begin{bmatrix} -5 & 10 & 1 & 0 \end{bmatrix}$$

$$w2 := \begin{bmatrix} 4 & -10 & 0 & 1 \end{bmatrix}$$

$$\left\{ \left[ \begin{array}{cccc} -\frac{5}{42} \sqrt{14} & \frac{5}{21} \sqrt{14} & \frac{1}{42} \sqrt{14} & 0 \end{array} \right], \right. \quad (6)$$

$$\left. \left[ \begin{array}{cccc} -\frac{16}{399} \sqrt{19} \sqrt{7} & -\frac{10}{399} \sqrt{19} \sqrt{7} & \frac{20}{399} \sqrt{19} \sqrt{7} & \frac{1}{19} \sqrt{19} \sqrt{7} \end{array} \right] \right\}$$