



Materia: Estructura de Datos I
INF 220

"Tema 2. TAD Polinomios"

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Santa Cruz de la Sierra – Bolivia © 2021



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```

Especificación Formal – TAD Polinomios

$$P(x) = 5x^3 + 3x^2 - 2x + 2$$

Operaciones

Evaluar $P(2) = 50$

Operaciones Binarias: C, P, Q ∈ Polinomios

$$C(x) = P(x) + Q(x)$$

[illegible]

Podemos Especificar un TAD para los Polinomios

Structure Polinomio

F

Declare Zero() \rightarrow Poly	//Define polinomio
Iszero(Poly) \rightarrow Boolean	//Esta vacío el Polinomio
Coef(Poly, exp) \rightarrow coef	//Obtiene el coef. del Polinomio
Attach(Poly, coef, exp) \rightarrow Poly	//Adiciona un elemento al Polinomio
Rem(Poly, exp) \rightarrow Poly	//Elimina un elemento del Polinomio
Smult(Poly, coef, exp) \rightarrow Poly	// Multiplicación por un monomio
Add(Poly, Poly) \rightarrow Poly	//Adición de Polinomios
Mult(Poly, Poly) \rightarrow Poly	//Multiplicación de Polinomios



Especificación Formal – TAD Polinomios

$\forall P, Q \in \text{Poly} \quad c, d \in \text{coef}, e, f \in \text{exp}$

Rem(Zero, f) ::= Zero

Rem(Attach(P, c, e), f) ::= If e=f Then Rem(P, f) Else Attach(Rem(P, f), c, e)

Iszero(Zero) ::= true

Iszero(Attach(P, c, e)) ::= If Coef(P, e) = -c then Iszero(Rem(P, e)) else false

Coef(Zero, e) ::= 0

Coef(Attach(P, c, e), f) ::= If e=f then c + Coef(P, f) else Coef(P, f)

Smult(Zero, d, f) ::= Zero

Smult(Attach(P, c, e), d, f) ::= Attach(Smult(P, d, f), cxd, e+f)

Add(P, Zero) ::= P

Add(P, Attach(Q, d, f)) ::= Attach(Add(P, Q), d, f)

Mult(P, Zero) ::= Zero

Mult(P, Attach(Q, d, f)) ::= Add(Mult(P, Q), Smult(P, d, f))

A



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Ejercicio de Especificación Formal – TAD Polinomios

Dado el Polinomio P y Q, diseñar el algoritmo para sumar dos polinomios (Add), utilizando las Funciones y Axiomas del TAD Polinomio. Se debe considerar la función Grado(Poly) la misma que obtiene el grado de un polinomio o exponente mayor.

Procedure Add()

C= Zero

While NOT (IsZero(P) and IsZero(Q)) do

Case

:Grado(P)<Grado (Q)

C=Attach(C, Coef(Q, Grado(Q)), Grado(Q))

Q=Rem(Q, Grado(Q))

:Grado(P)>Grado (Q)

C=Attach(C,Coef(P, Grado(P)), Grado(P))

P=Rem(P, Grado(P))

:Grado(P)=Grado (Q)

C=Attach(C,Coef(P, Grado(P))+ Coef(Q, Grado(Q)), Grado(P))

P=Rem(P, Grado(P))

Q=Rem(Q, Grado(Q))

End Case

End while



```
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  <a href="uni.wml"> uni con o bal des: 2003</a>
  <a href="back.wml"> back</a>
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Ejercicio de Especificación Formal – TAD Polinomios

Dado el Polinomio $P(x) = 3x^6 + 2x^4 + 3$ y el polinomio $Q(x) = 3x - 1$ cual es el resultado de aplicar las siguientes expresiones utilizando las Funciones y Axiomas del TAD Polinomio

Rem(P, 4)

Rem(Attach(P,-8,5),0)

Iszero(Attach(P,0,0))

Smult(Zero,3,6)

Smult(Attach(P,2,2),1,1)

Attach(Smult(P,1,1), 1*2, 2+1)

Add(P, Zero)

Add(P,Attach(P,3,2))

Attach(Add(P,Q),3,2)

Mult(P,Zero)

Mult(P,Attach(Q,4-2,3))

Add(Mult(P,Q),Smult(P,4-2,3))



```
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  <a href="uni.xml"> uni con o bal des 2003 </a>
  <a href="back.xml"> back </a>
</card>
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```

Ejercicio Implementacion – TAD Polinomios

```
public class clsPoly
{
    const int MAX = 100;
    float[] vCoef;
    int[] vExp;
    int nTerm;

    public clsPoly()
    {
        vCoef = new float[MAX];
        vExp = new int[MAX];
        for (int i = 0; i < MAX; i++)
        {
            vCoef[i] = 0;
            vExp[i] = 0;
        }
        nTerm = 0;
    }

    public clsPoly(clsPoly P)
    {
        vCoef = new float[MAX];
        vExp = new int[MAX];
        for (int i = 0; i <= P.nTerm; i++)
        {
            vCoef[i] = P.vCoef[i];
            vExp[i] = P.vExp[i];
        }
        this.nTerm = P.nTerm;
    }
}
```

```
// Declare el Polinomio Zero
public clsPoly Zero()
{
    return new clsPoly();
}

// Es Zero un Polinomio P
public bool IsZero()
{
    return (nTerm == 0);
}

// Adciona un termino al polinomio
public clsPoly Attach(clsPoly P, float Coef, int Exp)
{
    if ((Coef != 0) && (Exp >= 0))
    {
        P.nTerm++;
        P.vExp[Exp] = Exp;
        P.vCoef[Exp] = P.vCoef[Exp] + Coef;
    }
    return P;
}
```



```
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Ejercicio Implementacion – TAD Polinomios

```
// Elimina el termino con exponente Exp del polinomio P
public clsPoly Rem(clsPoly P, int Exp)
{
    if (Exp >= 0)
    {
        P.vCoef[Exp] = 0;
        P.vExp[Exp] = 0;
        P.nTerm--;
    }
    return P;
}

// Obtiene el coheficiente de un termino con exponente Exp del polinomio
public float Coef( int Exp)
{
    return vCoef[Exp];
}

// Obtiene el grado de un Polinomio
public int Grado()
{
    int Exp=0;
    for (int k = 0; k < MAX; k++)
    {
        if (vExp[k]>0)
            Exp=vExp[k];
    }
    return Exp;
}
```



```
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</card>
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```


Ejercicio Implementacion – TAD Polinomios

```
// Suma de dos polinomios
public clsPoly Add(clsPoly P, clsPoly Q)
{
    clsPoly C = new clsPoly();

    while ((P.IsZero()==true && Q.IsZero()==true)==false)
    {
        if (P.Grado() < Q.Grado())
        {
            C = Attach(C, Q.Ccoef(Q.Grado()), Q.Grado());
            Q = Rem(Q, Q.Grado());
        }
        if (P.Grado() > Q.Grado())
        {
            C = Attach(C, P.Ccoef(P.Grado()), P.Grado());
            P = Rem(P, P.Grado());
        }
        if (P.Grado() == Q.Grado())
        {
            C = Attach(C, P.Ccoef( P.Grado()) + Q.Ccoef( Q.Grado()), P.Grado());
            P = Rem(P, P.Grado());
            Q = Rem(Q, Q.Grado());
        }
    }
    return C;
}
```



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