

```
> restart; #ME770
> # u_xx(4th-order) .mws
> eq1:=u[i]=a;
```

$$eq1 := u_i = a$$

```
> eq2:=u[i+1]=a+b*dx+c*dx^2+d*dx^3+e*dx^4;
```

$$eq2 := u_{i+1} = a + b \, dx + c \, dx^2 + d \, dx^3 + e \, dx^4$$

```
> eq3:=u[i-1]=a-b*dx+c*dx^2-d*dx^3+e*dx^4;
```

$$eq3 := u_{i-1} = a - b \, dx + c \, dx^2 - d \, dx^3 + e \, dx^4$$

```
> dx2:=2*dx;
```

$$dx2 := 2 \, dx$$

```
> eq4:=u[i+2]=a+b*dx2+c*dx2^2+d*dx2^3+e*dx2^4;
```

$$eq4 := u_{i+2} = a + 2 \, b \, dx + 4 \, c \, dx^2 + 8 \, d \, dx^3 + 16 \, e \, dx^4$$

```
> eq5:=u[i-2]=a-b*dx2+c*dx2^2-d*dx2^3+e*dx2^4;
```

$$eq5 := u_{i-2} = a - 2 \, b \, dx + 4 \, c \, dx^2 - 8 \, d \, dx^3 + 16 \, e \, dx^4$$

```
> sol:=solve({eq1,eq2,eq3,eq4,eq5},{a,b,c,d,e});
```

$$sol := \left\{ d = -\frac{1}{12} \frac{u_{i-2} - u_{i+2} - 2 u_{i-1} + 2 u_{i+1}}{dx^3}, b = \frac{1}{12} \frac{-8 u_{i-1} + 8 u_{i+1} - u_{i+2} + u_{i-2}}{dx}, \right. \\ \left. a = u_i, e = \frac{1}{24} \frac{u_{i+2} + 6 u_i - 4 u_{i-1} - 4 u_{i+1} + u_{i-2}}{dx^4}, \right. \\ \left. c = -\frac{1}{24} \frac{-16 u_{i+1} + 30 u_i + u_{i+2} - 16 u_{i-1} + u_{i-2}}{dx^2} \right\}$$

```
> u:=a+b*x+c*x^2+d*x^3+e*x^4;
```

$$u := a + b \, x + c \, x^2 + d \, x^3 + e \, x^4$$

```
> u_xx:=diff(u,x,x);u_xx:=subs(x=0,u_xx);
```

$$u_{xx} := 2 \, c + 6 \, d \, x + 12 \, e \, x^2$$

$$u_{xx} := 2 \, c$$

```
> restart;
```

```
> c:=
```

```
-1/24*(-16*u[i-1]+30*u[i]-16*u[i+1]+u[i+2]+u[i-2])/(dx^2);
```

$$c := -\frac{1}{24} \frac{-16 u_{i-1} + 30 u_i - 16 u_{i+1} + u_{i+2} + u_{i-2}}{dx^2}$$

```
> u_xx:=2*c;
```

$$u_{xx} := -\frac{1}{12} \frac{-16 u_{i-1} + 30 u_i - 16 u_{i+1} + u_{i+2} + u_{i-2}}{dx^2}$$

```
>
```