

Melonie LeMond

Problem Set 3

1.

```
> restart;
```

```
> f:=x->exp(.1*x)*sin(x);
```

$$f := x \rightarrow e^{(0.1x)} \sin(x)$$

```
> t:=array(1..8);
```

$$t := \text{array}(1..8, [])$$

```
> for n from 1 to 7 do t[n]:=convert(taylor(f(x),x=0,n),polynom);end do;
```

$$t_1 := 0$$

$$t_2 := x$$

$$t_3 := x + 0.1x^2$$

$$t_4 := x + 0.1x^2 - 0.1616666667x^3$$

$$t_5 := x + 0.1x^2 - 0.1616666667x^3 - 0.01650000000x^4$$

$$t_6 := x + 0.1x^2 - 0.1616666667x^3 - 0.01650000000x^4 + 0.007504166667x^5$$

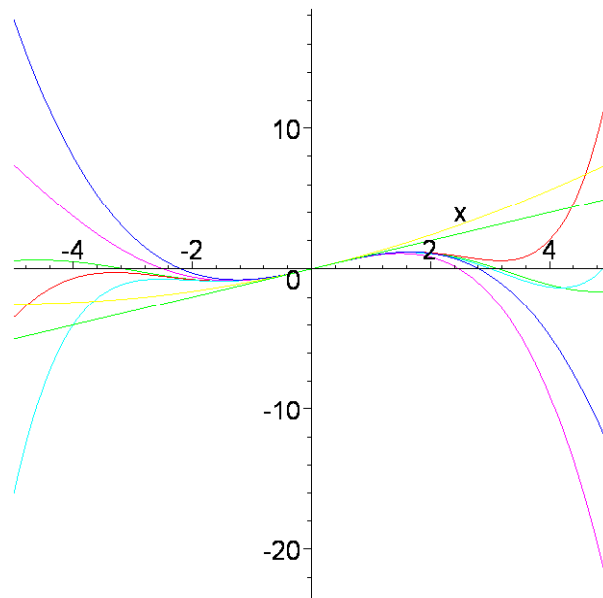
```
t_7 :=
```

$$x + 0.1x^2 - 0.1616666667x^3 - 0.01650000000x^4 + 0.007504166667x^5 + 0.0008056388888x^6$$

```
> t[8]:=f(x);
```

$$t_8 := e^{(0.1x)} \sin(x)$$

```
> plot(t,x=-5..5);
```



2.


```

[
      h := array(1..5, 1..5, [ ])
> for i from 1 to n do for j from 1 to n do h[i, j] := 1/(i+j-1);
> end do;
> end do;
> evalm(h);

```

$$\begin{bmatrix} 1 & \frac{1}{2} & \frac{1}{3} & \frac{1}{4} & \frac{1}{5} \\ \frac{1}{2} & \frac{1}{3} & \frac{1}{4} & \frac{1}{5} & \frac{1}{6} \\ \frac{1}{3} & \frac{1}{4} & \frac{1}{5} & \frac{1}{6} & \frac{1}{7} \\ \frac{1}{4} & \frac{1}{5} & \frac{1}{6} & \frac{1}{7} & \frac{1}{8} \\ \frac{1}{5} & \frac{1}{6} & \frac{1}{7} & \frac{1}{8} & \frac{1}{9} \end{bmatrix}$$

```

> inverse(h);

```

$$\begin{bmatrix} 25 & -300 & 1050 & -1400 & 630 \\ -300 & 4800 & -18900 & 26880 & -12600 \\ 1050 & -18900 & 79380 & -117600 & 56700 \\ -1400 & 26880 & -117600 & 179200 & -88200 \\ 630 & -12600 & 56700 & -88200 & 44100 \end{bmatrix}$$

```

> det(h);

```

$$\frac{1}{266716800000}$$

```

> cond(h);

```

$$943656$$

```

> for i from 1 to n-1 do evalm(submatrix(h, 1..i, 1..i));
> det(submatrix(h, 1..i, 1..i)); end do;

```

$$\begin{bmatrix} 1 \\ 1 & \frac{1}{2} \\ \frac{1}{2} & \frac{1}{3} \\ \frac{1}{2} & \frac{1}{3} \\ \frac{1}{12} \end{bmatrix}$$

$$\begin{bmatrix} 1 & \frac{1}{2} & \frac{1}{3} \\ \frac{1}{2} & \frac{1}{3} & \frac{1}{4} \\ \frac{1}{3} & \frac{1}{4} & \frac{1}{5} \end{bmatrix}$$

$$\frac{1}{2160}$$

$$\begin{bmatrix} 1 & \frac{1}{2} & \frac{1}{3} & \frac{1}{4} \\ \frac{1}{2} & \frac{1}{3} & \frac{1}{4} & \frac{1}{5} \\ \frac{1}{3} & \frac{1}{4} & \frac{1}{5} & \frac{1}{6} \\ \frac{1}{4} & \frac{1}{5} & \frac{1}{6} & \frac{1}{7} \end{bmatrix}$$

$$\frac{1}{6048000}$$

[>