MAPLE WORKSHEET FOR THE ANIMATED DISPLAY OF TAYLOR POLYNOMIALS

Based on a posting to sci.math.symbolic on 15 February 1994 by Helmer Aslaksen (mathelmr@nusunix.nus.sg)
Modified by Douglas B. Meade (meade@math.sc.edu) to work for an arbitrary function (not just sin).

Updated to Maple V, Release 4, by Douglas B. Meade (5 November 1996)

EXAMPLES:
 taylor_animate(sin(x), x=0, x=-5..5, frames=10);
 taylor_animate(exp(x), x=2, x= 0..5, frames=5);
 taylor_animate(ln(x), x=1, x=0.1..3, frames=10);

```
> restart;
> with(plots):
> taylor_animate := proc(FN::function, CENTER::name=numeric,
  DOMAIN::name=range, FRAMES::name=integer)
>   local VAR, t, p, n; global F, X0;
>   X0 := rhs(CENTER);
>   VAR := lhs(CENTER);
>   F := unapply(FN,VAR);
>   p := proc(n,x) local X;
  subs(X=x,convert(taylor(F(X),X=X0,n),polynom)) end;
>   for n to rhs(FRAMES) do print( P[n](VAR)=p(n,VAR) ) od;
>   animate( {F(x),'p(trunc(t),x)'}, DOMAIN, t=1..rhs(FRAMES),
  FRAMES, color=RED );
> end:
> taylor_animate(sin(x), x=0, x=-5..5, frames=10);
```

$$P_1(x) = 0$$

$$P_2(x) = x$$

$$P_3(x) = x$$

$$P_4(x) = x - \frac{1}{6}x^3$$

$$P_5(x) = x - \frac{1}{6}x^3$$

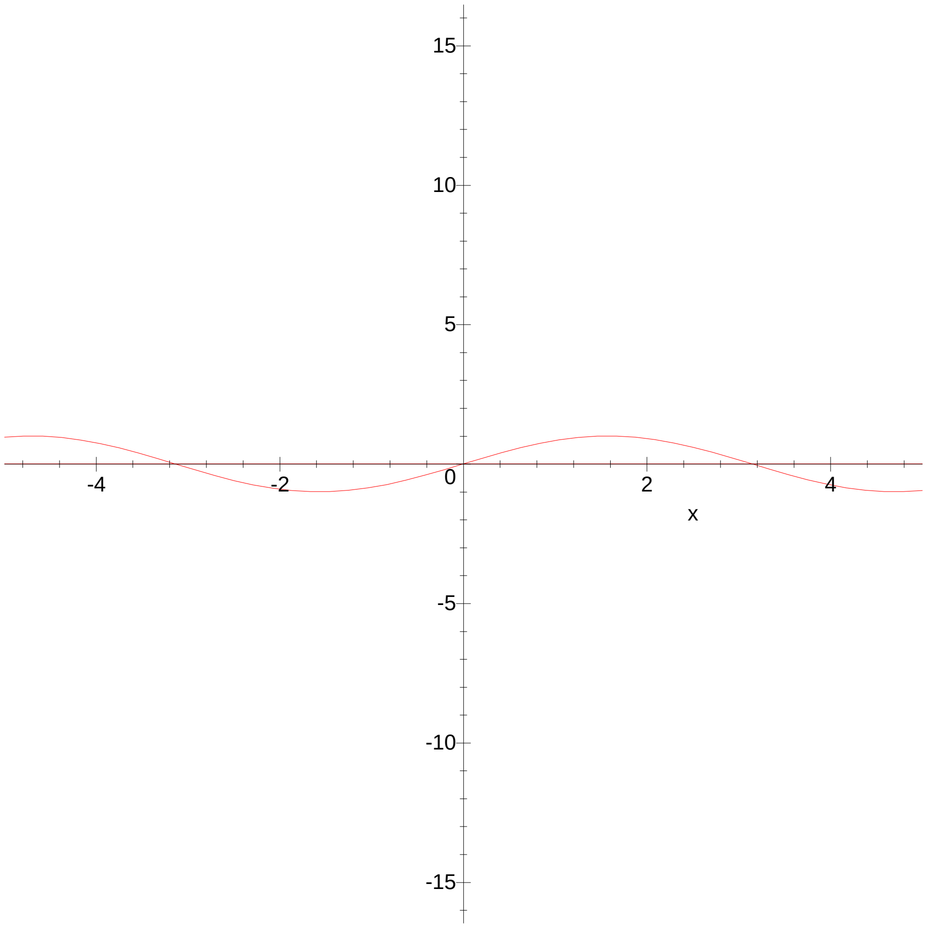
$$P_6(x) = x - \frac{1}{6}x^3 + \frac{1}{120}x^5$$

$$P_7(x) = x - \frac{1}{6}x^3 + \frac{1}{120}x^5$$

$$P_8(x) = x - \frac{1}{6}x^3 + \frac{1}{120}x^5 - \frac{1}{5040}x^7$$

$$P_9(x) = x - \frac{1}{6}x^3 + \frac{1}{120}x^5 - \frac{1}{5040}x^7$$

$$P_{10}(x) = x - \frac{1}{6}x^3 + \frac{1}{120}x^5 - \frac{1}{5040}x^7 + \frac{1}{362880}x^9$$




```
> taylor_animate(exp(x), x=2, x=0..5, frames=5 );
```

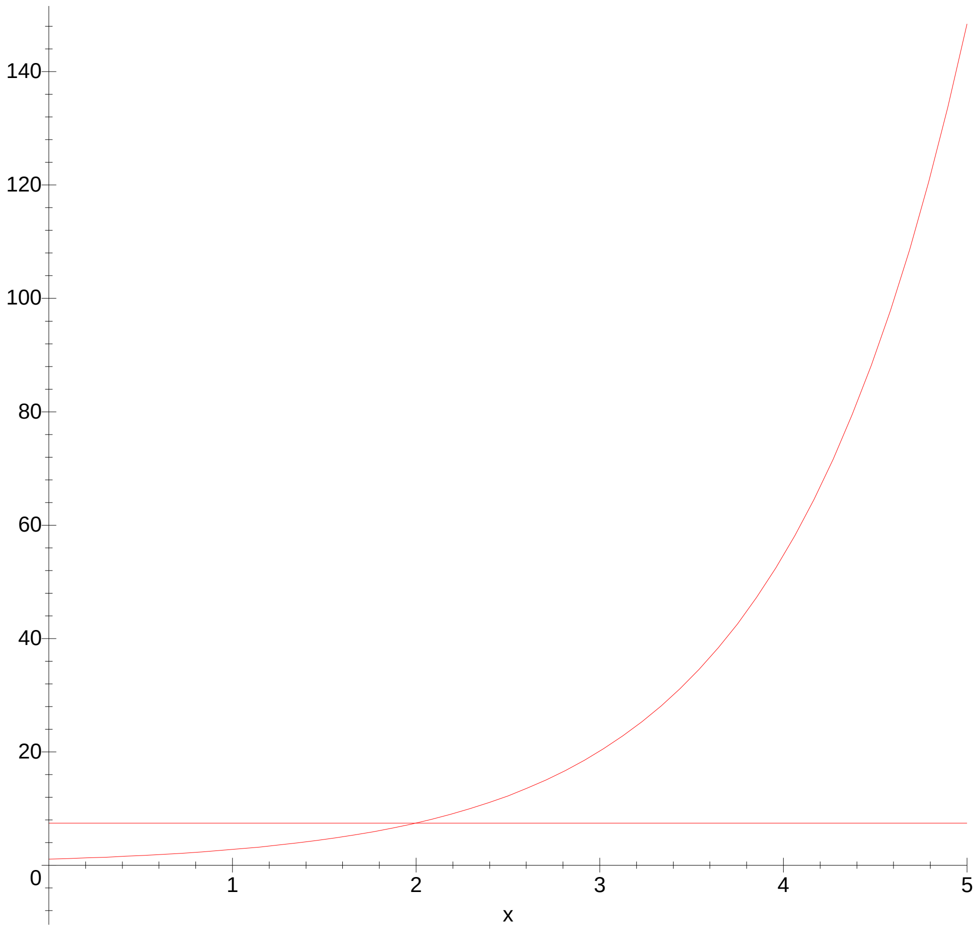
$$P_1(x) = \mathbf{e}^2$$

$$P_2(x) = \mathbf{e}^2 + \mathbf{e}^2\,(x-2)$$

$$P_3(x) = \mathbf{e}^2 + \mathbf{e}^2\,(x-2) + \frac{1}{2}\mathbf{e}^2\,(x-2)^2$$

$$P_4(x) = \mathbf{e}^2 + \mathbf{e}^2\,(x-2) + \frac{1}{2}\mathbf{e}^2\,(x-2)^2 + \frac{1}{6}\mathbf{e}^2\,(x-2)^3$$

$$P_5(x) = e^2 + e^2 (x-2) + \frac{1}{2} e^2 (x-2)^2 + \frac{1}{6} e^2 (x-2)^3 + \frac{1}{24} e^2 (x-2)^4$$




```
> taylor_animate(ln(x), x=1, x=0.1..2.5, frames=10);
```

$$P_1(x) = 0$$

$$P_2(x) = x - 1$$

$$P_3(x) = x - 1 - \frac{1}{2}(x-1)^2$$

$$P_4(x) = x - 1 - \frac{1}{2}(x-1)^2 + \frac{1}{3}(x-1)^3$$

$$P_5(x) = x - 1 - \frac{1}{2}(x-1)^2 + \frac{1}{3}(x-1)^3 - \frac{1}{4}(x-1)^4$$

$$P_6(x) = x - 1 - \frac{1}{2}(x-1)^2 + \frac{1}{3}(x-1)^3 - \frac{1}{4}(x-1)^4 + \frac{1}{5}(x-1)^5$$

$$P_7(x) = x - 1 - \frac{1}{2}(x-1)^2 + \frac{1}{3}(x-1)^3 - \frac{1}{4}(x-1)^4 + \frac{1}{5}(x-1)^5 - \frac{1}{6}(x-1)^6$$

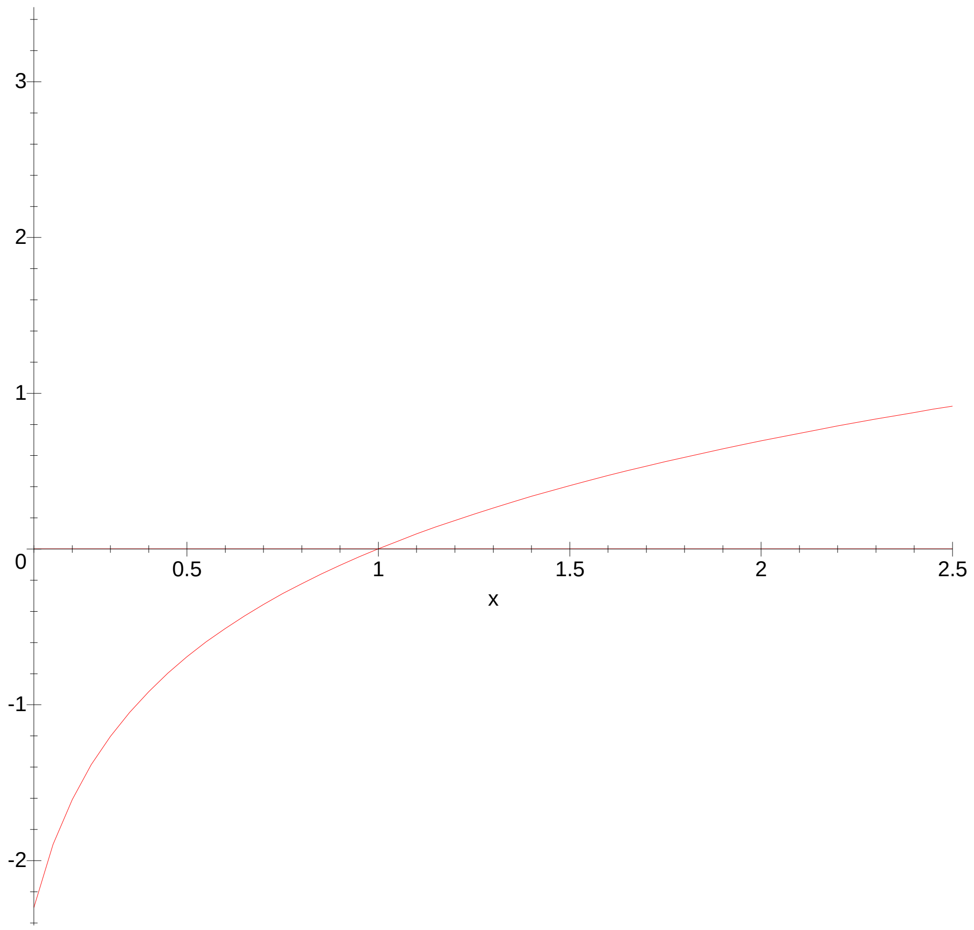
$$P_8(x) = x - 1 - \frac{1}{2}(x-1)^2 + \frac{1}{3}(x-1)^3 - \frac{1}{4}(x-1)^4 + \frac{1}{5}(x-1)^5 - \frac{1}{6}(x-1)^6 + \frac{1}{7}(x-1)^7$$

$$P_9(x) =$$

$$x - 1 - \frac{1}{2}(x-1)^2 + \frac{1}{3}(x-1)^3 - \frac{1}{4}(x-1)^4 + \frac{1}{5}(x-1)^5 - \frac{1}{6}(x-1)^6 + \frac{1}{7}(x-1)^7 - \frac{1}{8}(x-1)^8$$

$$P_{10}(x) = x - 1 - \frac{1}{2}(x-1)^2 + \frac{1}{3}(x-1)^3 - \frac{1}{4}(x-1)^4 + \frac{1}{5}(x-1)^5 - \frac{1}{6}(x-1)^6 + \frac{1}{7}(x-1)^7$$

$$- \frac{1}{8}(x-1)^8 + \frac{1}{9}(x-1)^9$$


3
2
1
0
-1
-2
0.5
1
1.5
2
2.5
x

>