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 Meade (meade@math.scarolina.edu) to work for an arbitrary function (not just sin).

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 );
```

```
> with(plots):
```

```
> taylor_animate := proc(FN:function, CENTER:name=numeric, DOMAIN:name=range, FRAMES:name=integer)
   local VAR, t;
   global X0, F, p, n;
   X0 := rhs(CENTER);
   VAR := lhs(CENTER);
   F := unapply(FN,VAR);
   p := (n,x)->subs(X=x,convert(taylor(F(X),X=X0,n),polynom));
   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 );
  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);

$$P_1(x) = e^2$$

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

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

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

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

To close, here is an example for you to think about before you execute the command. Some questions you might consider include: on what interval should the Taylor polynomials converge to the logarithm? How will you be able to determine this graphically? Symbolically?

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