

**Maple Assignment #2**  
**Math 113**  
**Due: December 5, 5p.m.**  
**No late assignments accepted.**

You may work in groups of up to three people. In this case, put all (up to three) names on one assignment, and turn in only one assignment. Show all work!

**Part I: Using Calculus to Graph**

1. Define the function  $P(x) = x^6 - 6x^5$ . Use the diff command to find the derivative of  $P$ .
2. Find all critical points of  $P$  and make a chart indicating where  $P$  is increasing and where it is decreasing. Determine which critical points give local maxima, which give local minima, and which give neither.
3. Use the diff command to find the second derivative of  $P$ .
4. Find all  $x$ -values where the second derivative of  $P$  is 0, and make a chart indicating where the graph of  $P$  is concave up and where it is concave down. Find all inflection points of  $P$ .
5. Use the information from steps 2 and 4 to sketch the graph of  $P$ . (This step is done by hand.)
6. Use the plot command to draw the graph of  $P$  for  $-3 < x < 6$ . Compare this graph to your sketch in step 5.

**Part II. Newton's Method**

7. Use MAPLE to define the two functions  $f(x) = e^{2x}$  and  $g(x) = x + 2$ . Make a plot on the same set of coordinate axes of  $f$  and  $g$ , being sure to choose  $x$  values so that you see both places where the graphs of the two functions cross. Note that the MAPLE command for  $e^{2x}$  is `exp(2*x)`.
8. Use Newton's method (applied to the function  $f(x)-g(x)$ ) to find all the  $x$  values where  $e^{2x} - (x + 2) = 0$ . Your choice of starting values should be motivated by the graph in part (1). Continue the iterations until there is no change in the values at least to the seventh decimal place. Show on your output all the iterations you calculate.

### Part III. Implicit Functions

9. Define the equation  $\cos(x)\sin(y) = .25$ , by using

```
>f:= cos(x-y)*sin(y)=.25
```

Right click on the expression you get after defining  $f$ , and use the “plots  $\rightarrow$  plots builder” command to plot the curve. First plot the curve with domain and range  $[-10,10]$ , and using the the grid  $[30,30]$ . Then do the same, but using the grid  $[100,100]$ . State what you think the “grid” does.

10. Find all values of  $y$  that correspond to the value  $x = 1$ . This can be done by defining

```
> c:=1;  
>subs(x=c,f);  
>evalf(solve(%))
```

(where the `%` imports the information from the preceding line). Make sure you get *all* the  $y$ -values for this  $x$ -value in the given window (check against your graph).

11. Find  $\frac{dy}{dx}$  for the function above, using MAPLE’s **implicitdiff** command and the **subs** command. You will need to use

```
>subs({x=1,y=??},implicitdiff(f,y,x))
```

where you obtain the value for  $y$  from the preceding question. Do this for every  $y$ -value in  $[-10,10]$  when  $x = 1$ . What pattern would you expect for these derivatives by looking at the graph?