

## Maple Problems

*Math 647*

- Plot  $y = \ln x + \sin x$  and  $y = x^2 - 1$  on the same set of axes.
  - What is the area between the curves?
- Find the cubic  $ax^3 + bx^2 + cx + d$  which has a local minimum at  $(-2, -1)$  and a local maximum at  $(4, 3)$ . Plot it.
- Find the  $x$  and  $y$  coordinates of all local extrema of

$$f(x) = \sin(x + \sin(3x))$$

on  $[0, 1.5]$ . (This is one of my favorite numerical problems. I'm a math professor. That tells you something.)

- There is one line which is tangent to the curve  $y = x^4 + x^3 - x^2 - x$  at two points. Find it, and plot both the curve and the line on the same set of axes to check your answer.
- It can be shown that for the initial value problem

$$\frac{d}{dr} \left( \frac{ru'(r)}{\sqrt{1 + (u'(r))^2}} \right) = ru(r),$$

$u(1) = a$ ,  $u'(1) = -1$ , there is precisely one value of  $a$  for which the solution is positive and bounded on  $[1, \infty)$ . Find that value of  $a$  to four decimals. (You'll have to use the numeric option on dsolve, and you'll have to plot the solution for various values of  $a$  to see what's going on. You should turn in some of these plots, but you need not turn in all of them.)