5. (*expires 2/20*) Consider the planar curve γ defined by $x^2y^3 + y^2 + y - 2e^x = 0$. Using **only** `Maple`, find the slope of the tangent line to the curve at $(0, 1)$. Then plot the curve and the tangent line on the same graph.
Hint: you might want to use `implicitplot` *from the library* `plots`. *You might find* `implicitdiff` *helpful, too.*

6. (*expires 2/20*) Define a `Maple` function g that, given a positive integer k yields the sum of the first k primes. What is k such that $g(k) \leq 100,000$ but $g(k+1) > 100,000$? You might find `sum` and `ithprime` helpful.

7. (*expires 2/20*) Use the Maclaurin series for $\arctan x$ (that is, the Taylor series about $x = 0$) evaluated at $x = 1/\sqrt{3}$ to compute the value of π to 30 places. How many terms are needed to compute the value of π to 50 places?

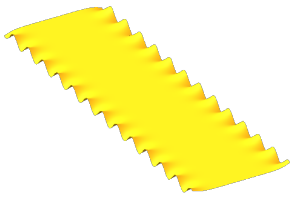
8. (*expires 2/20*) Use `Maple` to make pictures of the following pasta.


macaroni


fusilli


mezzi rigatoni


cellentani


lasagne

Here are some relevant equations, in no particular order.

$$z = \sin(2y)\left(1 - e^{-(x/6)^8}\right) \quad -6 \leq x \leq 6, \quad -20 \leq y \leq 20$$

$$\tau = 1 \quad 0 \leq \phi \leq \pi, \quad -\pi \leq \sigma \leq \pi \quad \text{(toroidal coordinates)}$$

$$x = \left(1 + \frac{\cos(s)}{2}\right)\cos(t) \quad y = \left(1 + \frac{\cos(s)}{2}\right)\sin(t) \quad z = 0.4t + \frac{\sin(s)}{2} \qquad \begin{array}{l} 0 \leq s \leq 2\pi \\ \frac{\pi}{2} \leq t \leq \frac{11\pi}{2} \end{array}$$

$$\left\{ \begin{array}{lll} x = r\sin(t) & y = r\cos(t) & z = t/2 \\ x = r\sin\left(t + \frac{2\pi}{3}\right) & y = r\cos\left(t + \frac{2\pi}{3}\right) & z = t/2 \\ x = r\sin\left(t - \frac{2\pi}{3}\right) & y = r\cos\left(t - \frac{2\pi}{3}\right) & z = t/2 \end{array} \right\} \qquad \begin{array}{l} 0 \leq r \leq 1 \\ 0 \leq t \leq 4\pi \end{array}$$

$$6 \leq r \leq 7 + \sin(20\theta)/2, \quad 0 \leq \theta \leq 2\pi, \quad 0 \leq z \leq 14 \qquad \text{(cylindrical coordinates)}$$

To help you get started, the `Maple` worksheet called pasta.mw draws Mezzi Rigatoni. For full credit, your pasta should look like pasta, with appropriate coloring, viewpoint, smoothness, and lighting. Sauce is optional.