Weekly Assignment #3

Instructions: **integrations in problems 1 and 2 must be evaluated by hand. Show your work.**

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1. Average value

Let $f(x) = x(\cos(2x) + \sin(3x))$.

a. Find the average value of $f(x)$ on $[0, \pi]$.

b. Using a graph of $f(x)$, approximate to at least two decimal places all the x-values between 0 and π for which $f(x)$ = average value.

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2. Area and Volume

Let R be the region in the plane between one arch of the curve $y = \cos(x)\sin(x)$ and the x-axis.

a. Find a range of values of x for this region.

b. Find the area of R.

c. Find the volume of the solid of revolution obtained by rotating R about the x axis.

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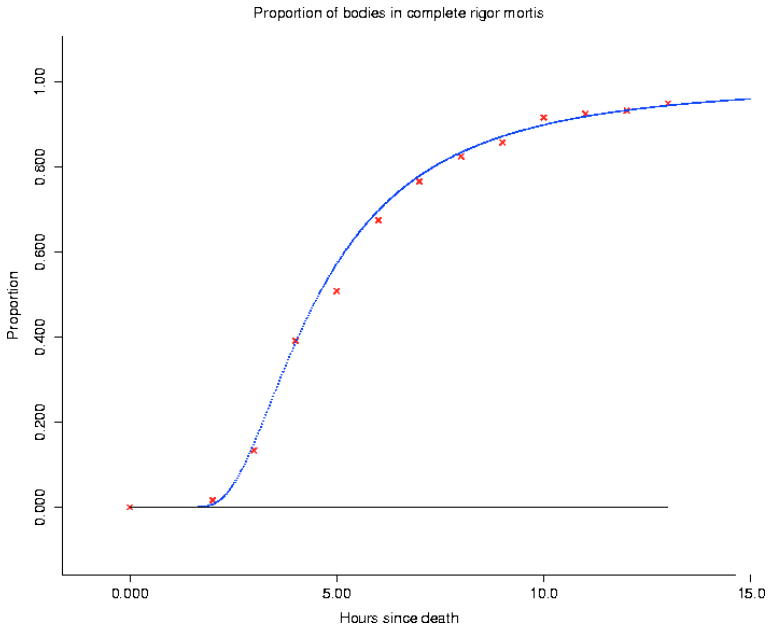
3. Application

When we die, our bodies become rigid (*rigor mortis* sets in). Niderkorn's (1872) observations on 113 bodies provides the main reference database for the development of *rigor mortis*. One can fit a lovely model to this somewhat unlovely data, for the proportion *p(t)* of bodies in complete *rigor mortis* after *t* hours. It is illustrated in the graph below:



The model is $e^{-\frac{26.28}{t^{2.39}}}$: that is,

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p[t_] := E^(-26.28 t^(-2.39))
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a. Compute the average proportion of bodies in rigor mortis in the time interval from 3 to 5 hours after death (write the integral, but you may use your calculator or Mathematica to produce your answer!).

b. You are called to the scene of a battle, and find 100 bodies strewn over the landscape. At 9:37 p.m., 87 of the bodies show complete *rigor mortis*. Find the most likely time that the act occurred, as predicted by the model. (Show how you arrive at the answer: you should be able to find the solution analytically – that is, by hand, without recourse to the calculator).