Math 151 Lab 2

Use Python to solve each problem.

1. Solve the following equations. Give exact real answers only.
   a) $\dfrac{15}{1+e^{-2x+1}} = 4$ (NOTE: use **exp** for the exponential function)
   b) $\ln(x) + \ln(x+7) = 3$ (NOTE: use **log** for the natural logarithm function)
2. A triangle has sides of length 10cm and 12cm and has an area of 50 sq cm.
   a) Find the approximate possible values of the third length of the triangle (HINT: $A = \sqrt{s(s-a)(s-b)(s-c)}$ where a, b, and c are the lengths of the sides and s is the semiperimeter of the triangle)
   b) For each possible triangle, use the Law of Cosines to find the angle (approximate value, in degrees) between the given sides. (NOTE that to find the angle, the Law of Cosines can be written as

$$C = \cos^{-1}\left(\frac{a^2+b^2-c^2}{2ab}\right)$$

3. Given the curve parametrized by $x = \dfrac{t^2-1}{t^2+1}$, $y = \dfrac{2t}{t^2+1}$:
   a) Use symbolic manipulations to show that the Cartesian equation of the curve is $x^2 + y^2 = 1$.
   b) Use the **plot_parametric** command to sketch the graph on the domain $t \in [-10, 10]$.
4. Given $f(x) = \dfrac{\sqrt{2x^2+1}}{3x-5}$:
   a) Find the y-values at $x = [-10, -100, -1000, 10, 100, 1000]$. Use the **evalf** command to convert all answers to floating-point decimals (remember what the Overview said about lists though! Alternatively, you can covert each input into a floating point decimal by putting ".0" at the end, i.e., $[-10.0, -100.0\cdots]$ etc.)
   b) Plot f on the domain $[-10, 10]$ and range $[-3, 3]$. Use the **ylim** option in your plot command to get the range.