Name: _____

Please show all work. Supply brief narration with your solutions and draw conclusions.

1. Suppose the success of a cancer treatment y, measured in fraction cancer free, depends upon the dosage x, in mg, of treatment drug in the following way: $\dfrac{x}{1+x^2}$.

   (a) Determine the dosage of drug that maximizes treatment success and the maximum possible faction cancer free, including units for each.

   (b) Explain the meaning of your answers to part (a) using a complete sentence and including units.

2. A scientist wishes to estimate the flow rate (in gallons per second) of water in a certain section of a river. To do so, the scientist must first estimate the cross-sectional area of the section of river (to use to estimate volume in gallons). To estimate the cross sectional area of the river, the scientist measures the depth of the river (in feet) at 1 foot intervals across the width of the river, resulting in the following data:

Width (x)	0	1	2	3	4	5	6	7	8
Depth (y)	0	1	3	7	5	9	5	3	0

   (a) Draw a picture of the river and cross-section.

   (b) Calculate a lower estimate of the cross-sectional area of this section of river

   (c) How can the estimate be improved?

   (d) If you fit a function to your data on the depth of the river (y) versus the width (x), how would the cross-sectional area of the river relate to this function?

3. Find antiderivatives (indefinite integrals) for the following functions. Show work.

   (a) $(\cos t)^2 \sin t$ (b) $\dfrac{4^{\sqrt{t}}}{\sqrt{t}}$ (c) $t\, 2^{3t+1}$

1	2	3	total (30)