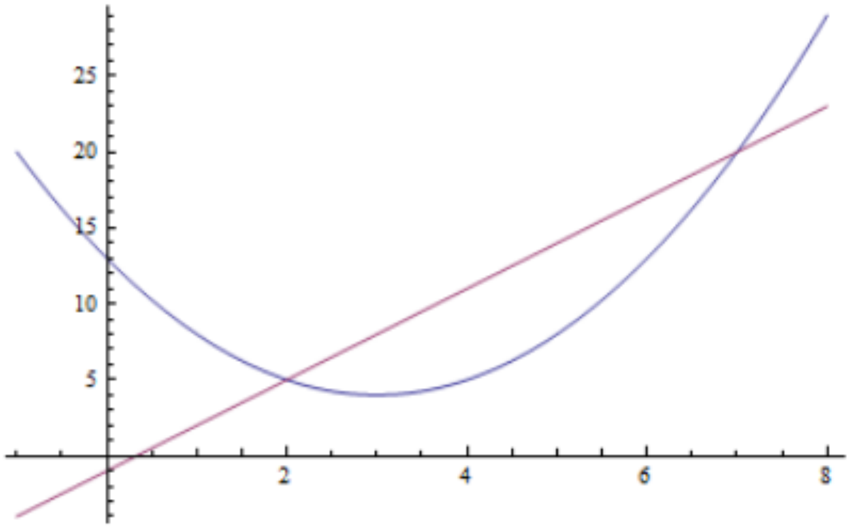
Recitation # 4: Volume by Shells & Length of Curves - Instructor Notes

Group work:

Problem 1 *Set up an integral that will compute the volume of the solid generated by revolving the region bounded by the curves* $y = x^2 - 6x + 13$ *(i.e.* $x = 3 \pm \sqrt{y-4}$*) and* $y = 3x - 1$ *about:*



Use both the washer method as well as the shell method for each problem. Which method would you prefer for each problem? Why?

(a) *the* x*-axis*

(b) $y = -4$

(c) $y = 22$

(d) *the* y*-axis*

(e) $x = -3$

(f) $x = 9$

Instructor Notes: Note that part (a) was on the Recitation # 3 handout. Remind the students about the solution of part (a). For (b)-(e), split these between the groups. Allow time for group work and discussion. During the discussion, you might want to talk about all of the "washer methods" before all of the "shell methods". Be sure that they recognize (by the end) that we slice **perpendicular** to the axis of revolution in the washer method and **parallel** to the axis of revolution in the shell method.

Problem 2 **Set up** *an integral (or a sum of integrals) to find the perimeter of the region bounded by the curves* $y = 2x^2 - 5x + 13$ *and* $y = x^2 + 6x - 11$.

Instructor Notes: It may be helpful to remind students that perimeter makes sense for more general two-dimensional shapes.

Problem 3 *Find the length of the following curves (length is in feet):*

(a) $y = \dfrac{1}{6}x^3 + \dfrac{1}{2x}$ *from* $\left(2, \dfrac{19}{12}\right)$ *to* $\left(3, \dfrac{14}{3}\right)$.

(b) $x = \dfrac{1}{9}e^{3y} + \dfrac{1}{4}e^{-3y}$ *from* $\left(\dfrac{13}{36}, 0\right)$ *to* $\left(\dfrac{265}{288}, \ln 2\right)$.

Instructor Notes: Split (a) and (b) amont the groups. Note that the focus here is on both the set-up **and** in solving the resulting integral (which boild down to writing the expression under the radical as a perfect square).
