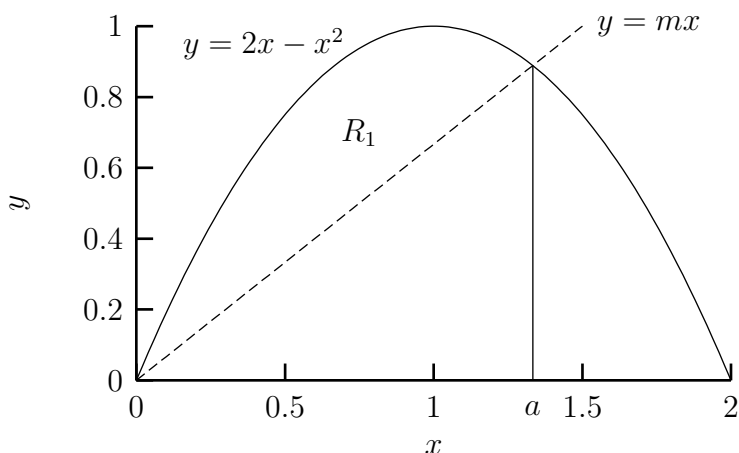


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Math 152:18 Calculus II
Workshop #3 Problem 8
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Problem 8: Let R be the first quadrant region bounded by the parabola $y = 2x - x^2$ and the x -axis. Find the constant m so that the line $y = mx$ divides R into two regions of the same area.

Hint: Let a be the x coordinate of the intersection of the line $y = mx$ and the parabola $y = 2x - x^2$.



To find the area of the region R_1 bounded above by the parabola and below by the line, we integrate the difference of the curves from 0 to a :

$$\int_0^a (2x - x^2) - mx \, dx.$$

We also need to relate a and m so that we are solving for only one unknown. This can be done by setting the two curves equal and solving for a .

$$\begin{aligned} ma &= 2a - a^2 \\ a^2 + (m - 2)a &= 0 \\ a &= 0 \text{ or } 2 - m. \end{aligned}$$

Since we already know that one of the intersections occurs at the origin, we can discard 0. Thus, $a = 2 - m$.

When solving the rest of the problem, the calculations become easier when using the unknown a instead of the unknown m . Then, once a value for a has been determined, m can be found by using the relationship $m = 2 - a$.