

MAT 137
Tutorial #11– Areas
January 23–24, 2017

1. Calculate the area of the region between the curve $y = 1 + \sin(2x)$, the x -axis, the y -axis, and $x = \pi/2$.
2. Find the area of the region bounded by the graph $y = 4x - x^2$ and the x -axis.
3. Find the area of the region between the curves $y = 5 - x^2$ and $y = 3 - x$.
4. Calculate the area of the total region bounded by the curves $2y + 1 = 0$ and $\cos x + y = 0$, from $x = 0$ to $x = 2\pi$.
5. Find the *total* area of the region bounded by the curves $y = x^3 - 2x + 2$ and $y = x^2 + 2$.
6. We want to compute the area of the region between the line $y = x - 1$ and the parabola $y^2 = 2x + 6$. We have two methods to calculate this one. For both methods, start by finding the points of interception and sketching the region.
 - (a) *Method 1.* Solve for y on the equation $y^2 = 2x + 6$. You will notice that there are two solutions. Look back at the graph. These correspond to the two branches of the parabola when we consider y as a function of x .
Try to decompose your area as the sum of two areas that you can write as integrals. Be careful.
 - (b) *Method 2.* Think of y as the variable and of x as a function of y .
7. Calculate the area of the region bounded by the curves $y^2 + 3y - x = 16$ and $|3y| - x = 0$.
8. Consider the collection of all parabolas with equations $y = (\cos a)(x^2 - \sin^2 a)$ where a is an arbitrary constant. Find the parabola such that the region between itself and the x -axis has the largest possible area.

Answers

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|------------------------|------------|
| 1. $\pi/2 + 1$ | 5. $37/12$ |
| 2. $32/3$ | 6. 18 |
| 3. $\frac{9}{2}$ | 7. 192 |
| 4. $\pi/3 + 2\sqrt{3}$ | 8. $?$ |