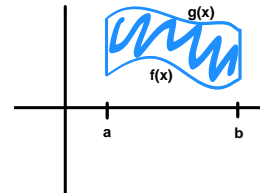


MA 114 Worksheet # 20: Center of Mass and Surface Area

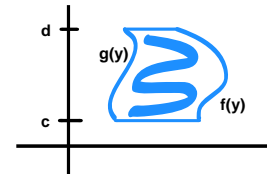
1. Conceptual Understanding:

- (a) Write down the formulas for the coordinates of the centroid of a plate with constant density bounded between $x = a$, $x = b$, $f(x)$, and $g(x)$ as in the figure to the right.



- (b) Write down the formulas for the coordinates of the centroid of a

plate with constant density bounded between $y = c$, $y = d$, $f(y)$, and $g(y)$ as in the figure to the right.



2. Find the center of mass for the system of particles of masses 4, 2, 5, and 1 located at the coordinates $(1,2)$, $(-3,2)$, $(2,-1)$, and $(4,0)$.
3. Point masses of equal size are placed at the vertices of the triangle with coordinates $(3, 0)$, $(b, 0)$, and $(0, 6)$, where $b > 3$. Find the center of mass.
4. Find the centroid of the region under the graph of $y = 1 - x^2$ for $0 \leq x \leq 1$. For practice, do this using both the approach from 1(a) and the approach from 1(b).
5. Find the centroid of the region under the graph of $f(x) = \sqrt{x}$ for $1 \leq x \leq 4$.
6. Find the centroid of the region between $f(x) = x^{-1}$ and $g(x) = 2 - x$ for $1 \leq x \leq 2$.
7. Let $m > n \geq 0$. Find the centroid of the region between x^m and x^n for $0 \leq x \leq 1$. Find values for m and n that force the centroid to lie outside of the region.

For Problems 8–10, compute the surface area for a revolution about the x-axis over the given interval.

8. $y = x$, $[0,4]$
9. $y = x^3$, $[0,2]$
10. $y = (4 - x^{2/3})^{3/2}$, $[0,8]$