MATH 110 Problem Set 5.1

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Thursday, April 9, 2026

The following problems based on Section 5.1 of the textbook will help you study. *You do not need to hand in solutions to these problems.*

1. (Based on 5.1.5–10) Sketch the region enclosed by the given curves. Draw a typical approximating rectangle and label its height and width. Then find the area of the region.

   (a) $y = x^2 - 2x$, $y = x + 4$

   (b) $y = 1 + \sqrt{x}$, $y = (3+x)/3$

   (c) $y = x^2$, $y = 4x - x^2$

   (d) $y = \cos x$, $y = 2 - \cos x$, $0 \le x \le 2\pi$

2. (Based on 5.1.13–28) Sketch the region enclosed by the given curves. Decide whether to integrate with respect to x or y. Draw a typical approximating rectangle and label its height and width. Then find the area of the region.

   (a) $4x + y^2 = 12$, $x = y$

   (b) $y = \sin(\pi x/2)$, $y = x$

   (c) $y = \cos x$, $y = 1 - \cos x$, $0 \le x \le \pi$

   (d) $y = |x|$, $y = x^2 - 2$

3. (Based on 5.1.35–36) Evaluate the integral $\displaystyle\int_0^4 \left|\sqrt{x+2} - x\right| \, dx$ and interpret it as the area of a region. Sketch the region.

4. (Based on 5.1.50) If the birth rate of a population is $b(t) = 2200 + 52.3t + 0.74t^2$ people per year and the death rate is $d(t) = 1460 + 28.8t$ people per year, find the area between these two curves for $0 \le t \le 10$. What does this area represent?

5. (Based on 5.1.56) Find the area of the region bounded by the parabola $y = x^2$, the tangent line to this parabola at $(1, 1)$, and the x-axis.

You may find the following additional exercises from Section 5.1 helpful.

5.1 C-level: 1–28, 29, 30–32;
B-level: 33–38, 46–50;
A-level: 53–60.