

1. Consider the region bounded by $y = \sin(x)$ and $y = \frac{2}{\pi}x$ (so that $0 \leq x \leq \frac{\pi}{2}$ and $0 \leq y \leq 1$). Write (**do not evaluate**) an integral that gives the volume obtained by rotating the region around the line $x = -1$. (3 points)

2. The integral

$$\int_0^2 \sqrt{36 \sin^2(2t) + 4 \cos^2(2t)} dt$$

gives the arclength of some curve. Sketch a curve that could lead to this integral (yes, your curve should be determined by the given integral). (3 points)

3. A calculus-loving polar bear has located a triangular ice floe that appears to be perfect for ice fishing, shown to the right (lengths are in meters). To confirm this, it wants to calculate the area of the the ice floe; being a polar bear, it insists on doing it using polar coordinates; and being a calculus-loving bear, it insists on doing it with calculus. Set up an integral in polar coordinates that will give the area. (4 points)

