Lab Worksheet for October 19, 2021

Practice with applications of definite integrals.

1. For the following problems determine the area of the region bounded by the given set of curves.

a) $f(x) = x^2 + 2$, $g(x) = \sin(x)$, over the interval $[-1,2]$

b) $f(x) = 8/x$, $g(x) = 2x$, over the interval $[2,4]$

c) $f(x) = e^{1+2x}$, $g(x) = e^{1-x}$, over the interval $[-2,1]$

d) $f(x) = \dfrac{1}{x+2}$, $g(x) = (x+2)^2$, over the interval $[-3/2,1]$

2. Find the area of the region between the curves $f(x) = \sin(x)$ and $g(x) = 1 - x^4 + \sin(x)$.

3. Consider a thin rod, $\frac{\pi}{2}$ meters long. The density of the rod, in terms of the distance from a fixed end, is given by $\rho(x) = \sin(x - \frac{\pi}{2})$, in kilograms per meter. What is the total mass of this rod in kilograms?

4. Find the work done when you push a box along the floor 2 m, when you apply a constant force of F=100N.

Now you are pushing the box up a curved ramp at a skate park. Because of the curvature of the ramp, when you are **x** meters into your pushing, you need to exert a force of $8\sin(x\pi)$ Newtons to keep the box moving. Find the total work needed for you to push the box 1 meter.

5. A four-inch-long pencil is laying on your desk. The part of the pencil closest to you is 2 inches away, while the part farthest from you is 6 inches away.

If x is the distance away from you, in inches, the density of the pencil is given by the function

$$\rho(x) = \frac{2}{x}$$

in ounces per inch. Find the mass of the pencil, in ounces.