Author 1 —————————— ☐

Author 2 —————————— ☐

Author 3 —————————— ☐
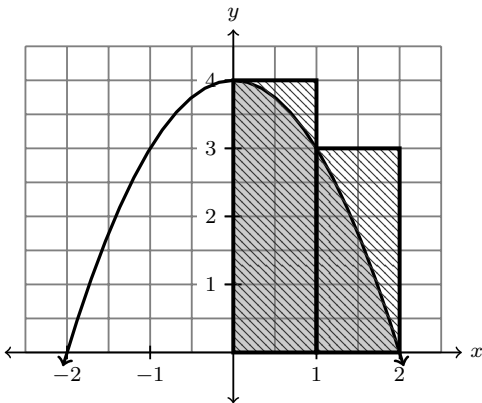
Author 4 —————————— ☐

Worksheet 20

1. The graph of $f(x) = 4 - x^2$ is below. Let A be the area under $f(x)$ from $x = 0$ to $x = 2$.
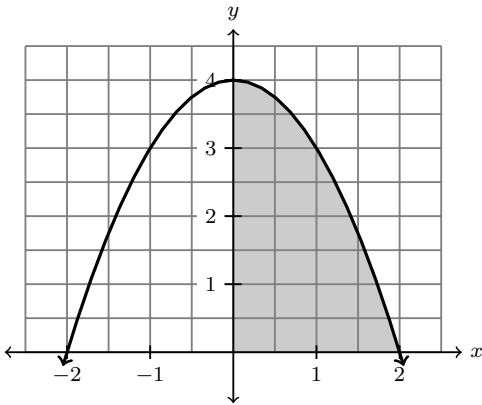
(a) Give your best estimate of the area A that you can. *Make sure to explain your answer.*
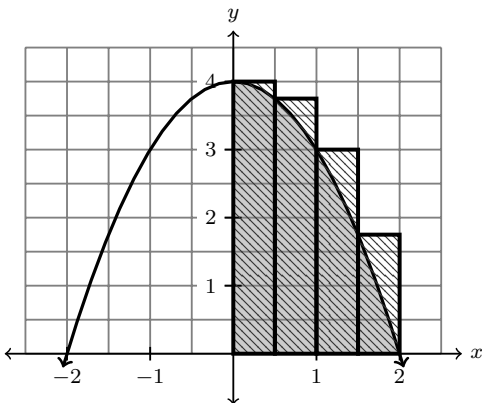
(b) Was your estimate an over or underestimate (or are you not sure)?

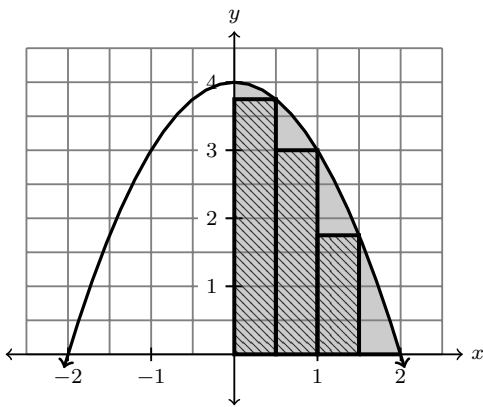**(c)** Estimate A by computing the area in the 2 large rectangles. Call this estimate L_2.

$L_2 =$

(d) Is L_2 an over or underestimate (or are you not sure)? *Explain.*

(e) Estimate A by computing the area in the 4 large rectangles. Call this estimate L_4.
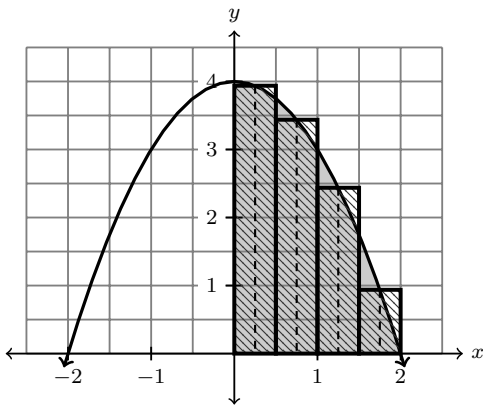
$L_4 =$

(f) Is L_4 an over or underestimate (or are you not sure)? *Explain.*

(g) Estimate A by computing the area in the 4 large rectangles. (Do you see where the fourth one is?) Call this estimate R_4.

$R_4 =$

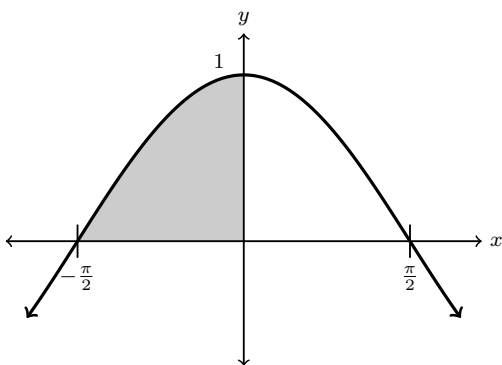**(h)** Is R_4 an over or underestimate (or are you not sure)? *Explain.*

(i) Estimate A by computing the area in the 4 large rectangles. Call this estimate M_4.

$M_4 =$

(j) Is M_4 an over or underestimate (or are you not sure)? *Explain.*

(i) Now what do you think is the best estimate of A? How could you get a better estimate?

2. The graph of $f(x) = \cos x$ is below. Let A be the area under $\cos(x)$ from $x = -\frac{\pi}{2}$ to $x = 0$.

(a) Estimate A using R_3, and **draw the associated rectangles**.

$R_3 =$

(b) Is R_3 an over or underestimate (or are you not sure)? *Explain.*