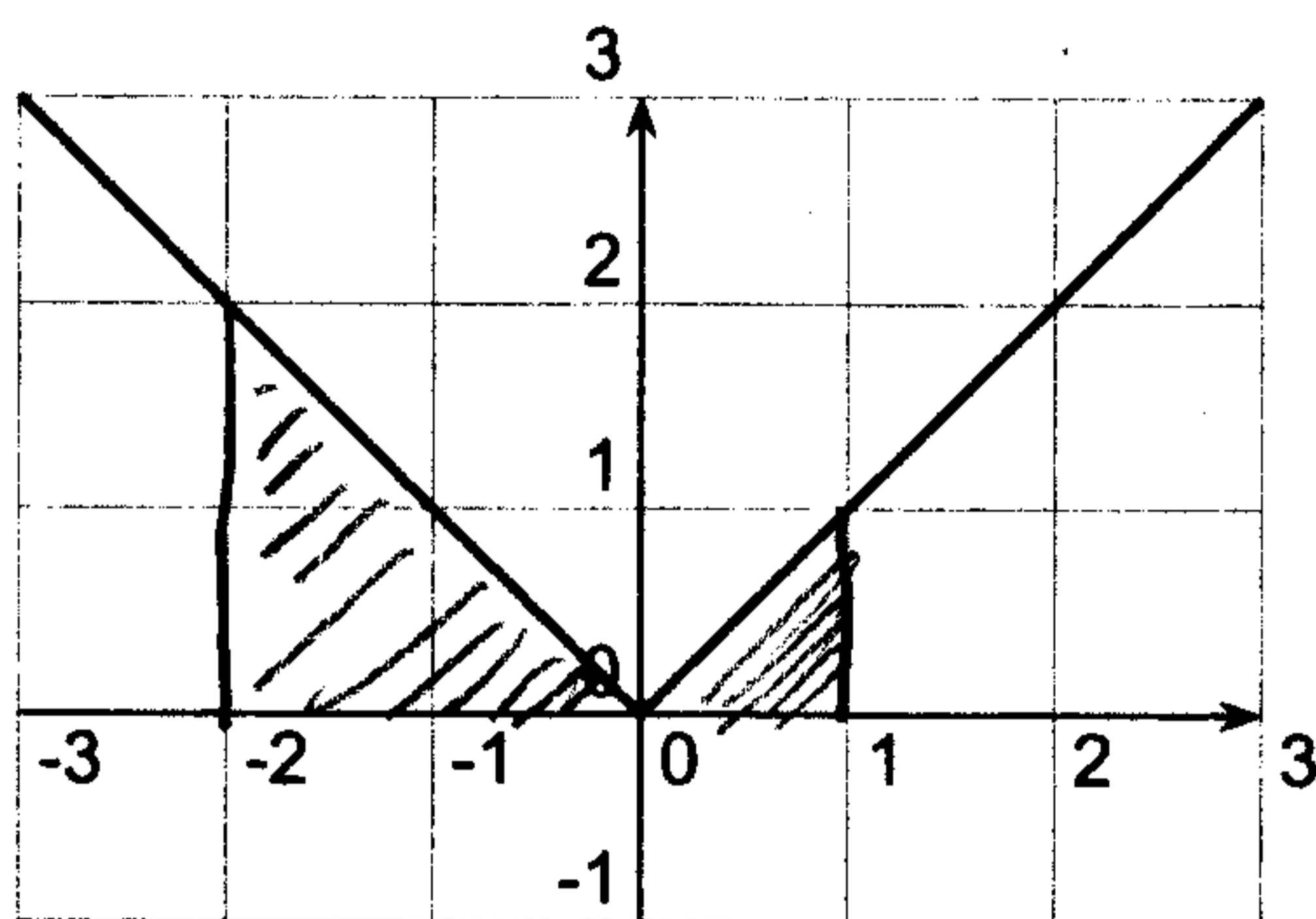


5. Let $f(x) = |x|$.

(a) (4 points) Find $\int_{-2}^1 f(x) dx$ using geometry (i.e., areas). Show your work on the graph below and circle your numerical answer.



$$\frac{1}{2}(2)(2) + \frac{1}{2}(1)(1) = \frac{1}{2}(4+1) = \boxed{\frac{5}{2}}$$

(b) (4 points) Find a formula for an antiderivative of $f(x)$, given the piecewise formula

$$f(x) = |x| = \begin{cases} x, & \text{if } x \geq 0 \\ -x, & \text{if } x < 0. \end{cases}$$

$$F(x) = \begin{cases} \frac{1}{2}x^2 & \text{if } x \geq 0 \\ -\frac{1}{2}x^2 & \text{if } x < 0 \end{cases}$$

(c) (4 points) Using the Fundamental Theorem and your answer to (5b), compute $\int_{-2}^1 f(x) dx$.

$$\begin{aligned} \int_{-2}^1 f(x) dx &= F(1) - F(-2) = \frac{1}{2}(1)^2 - \left(-\frac{1}{2}(-2)^2\right) \\ &= \frac{1}{2} \cdot 1 + \frac{1}{2} \cdot 4 = \boxed{\frac{5}{2}} \end{aligned}$$