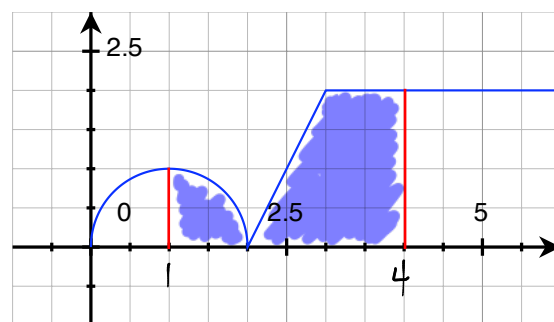


Read directions carefully and show all your work. Partial credit will be assigned based upon the correctness, completeness, and clarity of your answers.

1. (5 pts) Consider the graph of  $f$  shown below. Note:  $f$  consists of a semi-circle and straight line segments.

- (a) Shade the appropriate area on the graph to the right to represent the area determined by  $\int_1^4 f(x) dx$ .



- (b) Find the exact value of  $\int_1^4 f(x) dx$ .

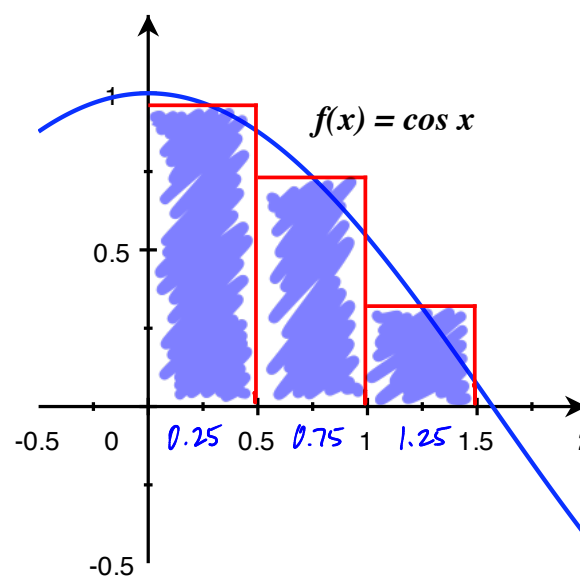
quarter circle + triangle + rectangle

$$\int_1^4 f(x) dx = \int_1^2 f(x) dx + \int_2^3 f(x) dx + \int_3^4 f(x) dx$$

$$= \frac{1}{4} \pi (1)^2 + \frac{1}{2} (1)(2) + 1(2) = \frac{\pi}{4} + 3$$

2. (5 pts) Consider  $\int_0^{1.5} \cos x dx$ .

- (a) Annotate the graph of  $f(x) = \cos x$  to show the area represented by the sum  $M_3$ . Be sure to shade the desired area.



- (b) Find  $M_3$ .

$$\Delta x = \frac{1.5 - 0}{3} = 0.5$$

$$M_3 = \sum_{k=1}^3 f(x_k) \Delta x = f(0.25)(0.5) + f(0.5)(0.5) + f(1.25)(0.5)$$

$$= 0.5 (\cos(0.25) + \cos(0.5) + \cos(1.25)) = 1.008$$