4. [14 points] The function
\[ f(x) = \sin(\sqrt{x}) \]
does not have an antiderivative that can be written in terms of elementary functions. However, we can use the second fundamental theorem of calculus to construct an antiderivative for \( f \).
We define an antiderivative \( F \) of \( f \) by
\[ F(x) = \int_0^x \sin(\sqrt{t})\,dt. \]

a. [2 points] The concavity of \( F \) does not change on the interval \( \left(0, \frac{\pi^2}{4}\right) \). Determine the concavity of \( F \) on \( \left(0, \frac{\pi^2}{4}\right) \) and circle one of the options below. No justification is needed.

[ ] Concave Up
[ ] Concave Down
[ ] Neither

b. [2 points] Using the blanks provided, order from least to greatest
\[ F\left(\frac{\pi^2}{4}\right), \quad \text{LEFT (100)}, \quad \text{RIGHT (100)}, \quad \text{MID (100)}, \quad \text{TRAP (100)}, \]
where all the approximations are of the definite integral given by \( F\left(\frac{\pi^2}{4}\right) \). No justification is needed.

\[ \underline{\underline{\ldots}}} \leq \underline{\underline{\ldots}}} \leq \underline{\underline{\ldots}}} \leq \underline{\underline{\ldots}}} \leq \underline{\underline{\ldots}}} \]

c. [4 points] Write out, but do not compute, MID (3) to approximate \( F\left(\frac{\pi^2}{4}\right) \).

d. [4 points] Write out, but do not compute, TRAP (3) to approximate \( F\left(\frac{\pi^2}{4}\right) \).

e. [2 points] If you want to approximate \( F\left(\frac{\pi^2}{4}\right) \) using right and left sums, what is the smallest number of subdivisions, \( n \), you would have to use to guarantee that the difference between \( \text{LEFT}(n) \) and \( \text{RIGHT}(n) \) is less than or equal to 0.005?