Name: ______________________

Clear your desk of everything excepts pens, pencils and erasers. If you have a question raise your hand and I will come to you.

1. (2 points) **Multiple Choice. No work needed. No partial credit available.** Suppose we want to approximate the area under the curve $f(x) = \sin x$ over the interval $[0, \frac{\pi}{2}]$ using three rectangles of equal width. What do we get if we approximate the area under the curve using right-hand endpoints?

   A. $\frac{(3+\sqrt{3})\pi}{6}$

   B. $\frac{(3+\sqrt{3})\pi}{12}$

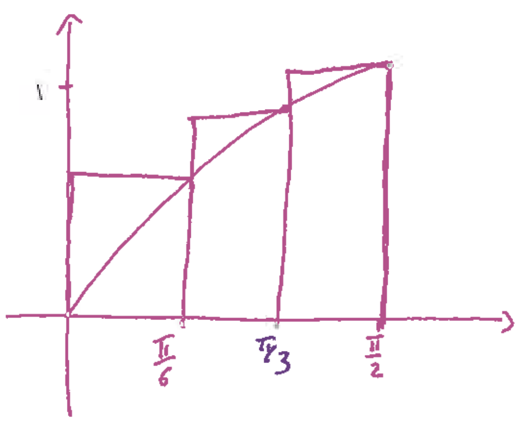
   C. $\frac{(2+\sqrt{3})\pi}{12}$

   D. $\frac{3+\sqrt{3}}{6}$

2. (1 point) **Fill-in-the-Blank. No work needed. No partial credit available.**
   Is your answer from the preceding question an overestimate or an underestimate? overestimate

Extra Work Space.

1



$$R_3 = \frac{\pi}{6}\left(f\left(\tfrac{\pi}{6}\right) + f\left(\tfrac{\pi}{3}\right) + f\left(\tfrac{\pi}{2}\right)\right)$$

$$= \frac{\pi}{6}\left(\frac{1}{2} + \frac{\sqrt{3}}{2} + 1\right)$$

$$= \frac{\pi}{6}\left(\frac{3+\sqrt{3}}{2}\right)$$

$$= \frac{(3+\sqrt{3})\pi}{12}$$

3. (2 points) Find the function $f(x)$ whose derivative is $f'(x) = \frac{3x^{\frac{3}{2}} - 5x^2}{\sqrt{x}}$ and whose graph includes the point $(1, 4)$.

$$F'(x) = \frac{3x^{3/2} - 5x^2}{x^{1/2}} = 3x - 5x^{3/2}$$

$$F(x) = \frac{3}{2}x^2 - 5\left(\frac{2}{5}\right)x^{5/2} + C$$

$$F(x) = \frac{3}{2}x^2 - 2x^{5/2} + C$$

Contains the point (1,4):

$$4 = F(1) = \frac{3}{2}(1) - 2(1) + C$$

$$4 = \frac{3}{2} + -2 + C$$

$$4 = \frac{-1}{2} + C$$

$$\frac{9}{2} = C$$

$$\boxed{F(x) = \frac{3}{2}x^2 - 2x^{5/2} + \frac{9}{2}}$$