Due at 6:00 pm on January 26, 2016

You may work on this assignment with your classmates or anybody else you please. You may get help from a tutor or even the instructor. What you may not do is simply copy somebody else’s work – that completely obviates the purpose of the assignment. If you forget to complete the assignment before it is due, do not simply copy someone else’s paper and turn that in... that is not “working together,” that is taking credit for somebody else’s work.

All work on this assignment will be evaluated for your style of presentation as well as for the “correctness” of your “answer.” Follow the writing guidelines established during lecture and lab. You may not use your calculator and all results must be completely algebraically substantiated on your paper.

1. Evaluate \( \int_{\sqrt{3}}^{2} 20x (3 - x^2)^{29} \, dx \) by making the substitution \( u = 3 - x^2 \).

\[
\begin{align*}
\int_{\sqrt{3}}^{2} 20x (3 - x^2)^{29} \, dx &= 20 \int_{\sqrt{3}}^{2} (3 - x^2)^{29} \, dx \\
&= \int_{\sqrt{3}}^{2} u^{29} \, du \\
&= -\frac{1}{30} \left[ u^{30} \right]_{\sqrt{3}}^{2} \\
&= -\frac{1}{30} \left( -1 \right)^{30} - \left( -\frac{1}{3} \right)^{30} \\
&= -\frac{1}{3}
\end{align*}
\]
2. A function named \( f \) is shown in Figure 1. \( f \) is semi-circular over \([-4, 0]\) and then again over \([0, 6]\). 
\( F \) is the antiderivative of \( f \) that passes through the point \((0, \pi)\). The letters A and B represent the area of the indicated semicircular regions. Answer each question on this page with regards to this information. Please simply fill the indicated quantities into the provided blanks; perform any necessary calculations on scratch paper.

\[ a. \quad A = \frac{4}{3} \pi \]

\[ b. \quad B = \frac{2}{3} \pi \]

\[ c. \quad \int_{-4}^{6} f(x) \, dx = \frac{2.5 \pi}{A - B} \]

\[ d. \quad \int_{-2}^{3} f(x) \, dx = \frac{1.25 \pi}{A - B} \]

\[ e. \quad \int_{-2}^{3} f'(x) \, dx = \frac{5}{f(3) - f(-2)} \]

\[ f. \quad F(6) = \frac{5.5 \pi}{\pi + \frac{3}{2}} \]

\[ g. \quad F(-2) = \frac{2 \pi}{\pi + \frac{3}{2}} \]

\[ h. \quad \int_{-2}^{3} f(2x) \, dx = \frac{1.25 \pi}{A - B} \]

\[ \frac{1}{2} F(2x) \bigg|_{-2}^{3} = \frac{1}{2} \left( f(4) - f(-4) \right) = \frac{1}{2} (A - B) \]

\[ i. \quad \int_{-4}^{6} (f(x) - 3) \, dx = -2.5 \pi + 30 \]

\[ \int_{-4}^{6} f(x) \, dx - \int_{-4}^{6} 2 \, dx = (B - A) - (3 \pi (10)) \]