n-Calculator:

Evaluate the following definite integrals:

1. \[ \int_{1}^{4} \left( 6x^2 - 8x + 3 \right) dx \]
2. \[ \int_{1}^{5} \frac{3x}{\sqrt{2x^2 + 5}} dx \] \[ u = 2x^2 + 5 \] \[ \frac{du}{dx} = 4x \] \[ dx = \frac{du}{4x} \]
3. \[ \frac{\pi}{3} \int_{0}^{\pi} (\csc(2x) - \csc(2x)\cos^2(2x)) dx \]
4. \[ \int_{2}^{5} \frac{-3x}{(x^2 - 3)^2} dx \] \[ u = x^2 - 3 \] \[ \frac{du}{dx} = 2x \] \[ dx = \frac{du}{2x} \]
5. \[ \frac{dy}{dx} = 2x + 4x^3 \quad \text{and} \quad f(2) = -6, \text{ find } f(x). \]

6. Given: \[ \int_{2}^{6} g(x) \, dx = 15 \quad \text{and} \quad \int_{6}^{13} g(x) \, dx = 8 \quad \text{and that the function is continuous,} \]
   differentiable and greater than zero on \((-\infty, \infty)\), find the following values:
   a) \[ \int_{6}^{13} g(x) \, dx = -8 \] 
   b) \[ \int_{2}^{13} g(x) \, dx = 23 \] 
   c) \[ 3 \int_{2}^{6} g(x) \, dx = 45 \] 
   d) \[ 2 - \int_{6}^{13} g(x) \, dx = 2 - 23 = -21 \]
7. A particle is moving along a horizontal path such that its velocity is given by the function \( v(t) = t^2 - 10t + 16 \). Set up an integral expression and use a graphing calculator to evaluate the integral that will give you the following:

a) The total distance traveled in the first 12 seconds.
\[
\int_0^{12} |v(t)| \, dt = 120 \, \text{ft}.
\]

b) The displacement in the first 12 seconds.
\[
\int_0^{12} v(t) \, dt = 48 \, \text{ft}.
\]

8. Given \( f(x) = 4 + \sqrt{x-2} \), approximate the area bounded by \( f(x) \), the lines \( x = 2 \), \( x = 12 \) and the \( x \)-axis if \( n = 5 \)

\[
\Delta x = \frac{12 - 2}{5} = 2
\]

a) Right endpoints
\[
\begin{align*}
R_5 &= (2) \left[ f(2) + f(4) + f(6) + \ldots + f(12) \right] = 63.709
\end{align*}
\]

b) Left endpoints
\[
\begin{align*}
L_5 &= (2) \left[ f(2) + f(4) + \ldots + f(12) \right] = 57.384
\end{align*}
\]

c) Midpoints
\[
\begin{align*}
M_5 &= (2) \left[ \frac{f(2) + f(4) + \ldots + f(12)}{2} \right] = 61.228
\end{align*}
\]

d) Trapezoids
\[
\begin{align*}
T_5 &= \frac{(2)}{2} \left[ f(2) + 2f(4) + 2f(6) + 2f(8) + 2f(10) + f(12) \right] = 60.541
\end{align*}
\]

9. The rate at which factory B produces jellybeans is modeled by the function \( r(t) = 80 + 5\sqrt{x+1} \) where \( t \) is time in hours since the factory opens and \( r(t) \) is measured in pounds of jellybeans. The factory has to fill 31 pound bags for shipping to regional distributors. On Tuesday, April 5th, the factory closes at 5:00 pm and has 27 pounds of jellybeans left unpacked in a shipping bag. The next day, they open at 9:00 am and close at 5:00 pm. How many total bags (31 pounds each) were they able to ship out on Wednesday, April 6th?

\[
27 + \int_0^8 r(t) \, dt = 753.007 \, \text{pounds}
\]

\[
\frac{753.007}{31} = 24.318 \, \text{bags}
\]