Student Package

The commands in this package can be used after typing with(student); Examples of some of them are listed below.

```
distance([2,3],[4,6]);  # Computes the distance between 2 points.
leftbox(x^2,x=0..2,10);  # Plots 10 rectangles under the curve with height of the left endpoint of each subinterval. The rightbox and middlebox commands are similar.
leftsum(x^2,x=0..2,10);  # Writes the leftsum with 10 subdivisions in sigma form.
evalf(%);  # Evaluates the sum.
showtangent(x^2,x=2);  # Plots the curve \( f(x) = x^2 \) and its tangent line at \( x = 2 \).
```

Derivatives

```
diff(x^3+3*x^2-2*x+1,x);  # Finds the derivative of \( y = x^3 + 3x^2 - 2x + 1 \)
diff(x^3+3*x^2-2*x+1,x,x);  # Finds the second derivative. Instead of \( x,x \), \( x^2 \) can be used.
a:=diff(x^2*y(x)+2*x*y(x)^2+3*x-4*y(x),x);  # Differentiates implicitly.
solve(a,diff(y(x),x));
```

```
f:=x->x^2-3*x+4;  # Names \( f \) as a function of \( x \).
fx:=D(f);  # \( D(f) \) takes the derivative and makes it a function of \( x \).
fx(3);  # Evaluates the derivative at \( x = 3 \).

g:=(x,y)->x^2+2*x*y+y^3;  # Names \( g \) as a function of \( x \) and \( y \).
gx:=D[1](g);  # Takes the partial derivative with respect to \( x \), the first variable listed.
gy:=D[2](g);  # Takes the partial derivative w.r.t. \( y \).
```

Integrals

```
int(x^2-3*x+1,x);  # Finds an antiderivative.
int(x^2-3*x+1,x=1..4);  # Finds the definite integral.
fsolve(int(exp(-x^2/2),x=0..1)=.2);  # Solves the equation.
```
**Differential Equations**

\[ f := \text{diff}(y(x), x) = x/y(x); \]  
Inputs the equation \( \frac{dy}{dx} = \frac{x}{y} \)

\[ \text{dsolve}(f, y(x)); \]  
Solves the differential equation.

\[ \text{dsolve}([f, y(2)=1], y(x)); \]  
Solves it with an initial condition. \{ \} are necessary for solving more than one equation.

\[ g := \text{diff}(y(x), x, x) - 3*\text{diff}(y(x), x) - 10*y(x) = 0; \]  
Inputs \( \frac{d^2y}{dx^2} - 3 \frac{dy}{dx} - 10y = 0 \)

\[ \text{dsolve}([g, y(0)=2, y(3)=4], y(x)); \]  
Solves it with the initial conditions.