1. Log in to your Sage Cloud account.
   
   (a) Start the Chrome browser.
   (b) Go to http://cloud.sagemath.com and sign in.
   (c) You should see an existing Project for our class. Click on that.
   (d) Click “New”, call it c06, then click “Sage Worksheet”.

Calculus in Sage

2. Find the derivatives for \(x^2, 2x^4, \log(x), \sin(x), e^{2x},\) and \(x^x\) using the command \(\text{diff}(f(x),x)\) (put your function in for \(f(x)\)).

3. Find the 2\(^{nd}\) derivatives for \(x^2, 2x^4, \log(x), \sin(x), e^{2x},\) and \(x^x\) using the command \(\text{diff}(f(x),x,2)\) (put your function in for \(f(x)\)).

4. Let \(g(x) = x^x\). Sketch the graph of \(g(x)\). Let \(g\prime(x) = \text{diff}(g(x),x)\). Evaluate \(g\prime(1)\) and \(g\prime(0)\). Explain.

5. Sketch the graph of \(g\prime(x)\). Solve when \(g\prime(x) = 0\).
7. Find \( g(x).\text{derivative}() \).

8. Let \( h(x,y)=xy \). Find \( \frac{\partial h}{\partial x} \) the partial derivative of \( h(x) \) with respect to \( x \) by hand.

9. Let \( h(x,y)=xy \). Find \( \text{diff}(h(x,y),x) \).

10. Find \( \frac{\partial h^2}{\partial x \partial y} \). Now try \( \text{diff}(h(x,y),x,y) \)

11. Find \( \frac{\partial h^2}{\partial x^2} \).

12. Try \( h.\text{derivative}() \). Explain what you get.

13. Find \( \int 3x \, dx \). Check with \( \text{integral}(3*x,x) \)

14. Let \( f(x)=3x \). Let \( \text{fint}=\text{integral}(3*x,x) \). Check that \( \text{diff(fint,x)}=f(x) \).

15. Find \( \int_1^2 f(x) \, dx \). Check using \( \text{integral}(f(x),x,1,2) \).

16. Sketch \( g(t) = t^{20}e^t \) on \((0,3)\).

17. Find \( \int t^{20}e^t \, dt \).

18. Find \( \int_2^3 t^{20}e^t \, dt \).

19. Find a numerical approximation for \( \int_2^3 t^{20}e^t \, dt \).

20. Try \( \text{numerical_integral}(t^{20}e^t, 2, 3) \). Find out what the second number of your answer means.