Name:
Section 4.3
Math 151

1. For $f(x) = 2x^3 - 9x^2 + 12x + 1$ on $[-0.5, 3]$

   (a) Find f, f''
   $f'(x) = 6x^2 - 18x + 12$ and $f''(x) = 12x - 18$.

   (b) Find and classify the critical points of f.
   $f'(x) = 0 \Longrightarrow 6x^2 - 18x + 12 = 0 \Longrightarrow 6(x-2)(x-1) = 0$ therefore $x = 1, 2$ are critical points. We can use the second derivative test to classify thes points. Indeed,

   $$f''(1) = -6 \text{ therefore } x = 1 \text{ is a local max}$$

   and

   $$f''(2) = 6 \text{ therefore } x = 2 \text{ is a local min}$$

   (c) Find any inflection points of f.

   $$f''(x) = 0 \Longrightarrow 12x - 18 = 0$$

   therefore $x = \frac{3}{2}$ is a potential inflection point. We can also check that $f''(x)$ changes sign at $x = \frac{3}{2}$ by pluging in values to the left and right of the point to confirm that this is an inflection point

   (d) Identify the global maximum and minimum values of f.

   The global max or min values may occur at the critical points or endpoints so we evaluate f at these points:

   $$f(-0.5) = -7.5 \quad f(3) = 10 \quad f(1) = 6 \quad f(2) = 5$$

   So we can conclude that the global minimum of f is -7.5 and the global max is 10. Plot the function f in Desmos to confirm this.