MATH-241 Calculus I — Created by Pierre-O. Parisé
Worksheet 03 — Fall 2021, 08/10/2021

Last name: ______________________________
First name: ______________________________
Section: ______________________________

Question:	1	2	Total
Points:	10	10	20
Score:			

Instructions: You must answer all the questions below and give your solutions to the TA at the end of the recitation. Write your solutions on a different sheet of paper. No late worksheet will be accepted.

Question 1 **(10 pts)**

Find the critical points of the function $f(x) = \frac{2}{5}x^{5/2} - 2\sqrt{x}$.

Solution: The derivative of the function is $f'(x) = x^{3/2} - \frac{1}{\sqrt{x}}$. We see that the derivative doesn't exist at $x = 0$. Also, we have

$$f'(x) = 0 \iff x^{3/2} = \frac{1}{\sqrt{x}} \iff x^2 = 1 \iff x = \pm 1.$$

So the critical values are $x = \pm 1$ and $x = 0$.

QUESTION 2 **(10 pts)**

Find the local maximum and minimum of the function $f(x) = x^4 - 2x^2 + 3$ (Use the first derivative test or the second derivative test).

Solution: We take the first derivative:

$$f'(x) = 4x^3 - 4x = 4x(x^2 - 1) = 4x(x-1)(x+1).$$

The critical points occur at $x = 0$, $x = 1$ and $x = -1$.

The second derivative is

$$f''(x) = 12x^2 - 4 = 4(3x^2 - 1).$$

If we plug in each critical points:

- $f''(0) = -4 < 0$ and so f has a local maximum at $x = 0$. The value is $f(0) = 3$.
- $f''(1) = 8 > 0$, and so f has a local minimum at $x = 1$. The value is $f(1) = 1$.
- $f''(-1) = 8 > 0$, and so f has a local minimum at $x = -1$. The value is $f(-1) = 1$.