Week 10: Extrema

Welcome to the Weekly Review for MATH 2413. This week’s review talks about Extrema. We would like to thank Patrick Bourque and the Fall 2014 MATH 2413 students for allowing us to film the Weekly Reviews.

The following problems are presented in the Week 10 videos. Thank you!

Part A: Absolute Extrema

1. Introduction to Absolute Extrema and Critical Numbers

2. Find the absolute extrema for the following functions on the given interval:

   (a) \( f(x) = x^5 - 5x^3 - 20x \); \([-3, 4]\)
(b) \( f(x) = 6x^2(x - 16)^\frac{3}{2} \); \([-11, 24]\)

(c) \( f(x) = \cos(2x) + 2\cos(x) \); \([0, 2\pi]\)
(d) $f(x) = e^{2x} - 12e^x + 10x$ ; $[0,10]$ 

Part B: Relative Extrema

1. Introduction to Relative Extrema
2. Find where $f$ is increasing and decreasing and find all Relative Exterma:

(a) $f(x) = 3x^4 - 16x^3 + 18x^2$

(b) $f(x) = \frac{x^2 - 2x + 1}{(x-3)^2}$
(c) $f(x) = 3x^{3\frac{1}{3}}(x^2 - 36)$

**Part C: Theorems**

1. Rolle’s Theorem

2. Show that the hypothesis of Rolle’s Theorem applies and find all values of $c$ guaranteed by the theorem:

   (a) $f(x) = x^4 - 4x^3 + 5x^2 - 2x$ on the given interval $[0, 2]$
(b) $f(x) = \sin(2x) + 2\cos(x)$ on the given interval $[0, 2\pi]$

3. Mean Value Theorem

4. Show that the hypothesis of the Mean Value Theorem applies and find all values of $c$ guaranteed by the theorem:

   (a) $f(x) = \frac{x+1}{x}$ on the given interval $[\frac{1}{2}, 2]$