Bellwork 11/13

$$f(x) = \sin(x)$$

Find the absolute extrema of f for $x \in [0, \frac{3\pi}{2}]$.

: : reset

Bellwork 11/13 - Solution

Find where critical points occur, for $x \in (0, \frac{3\pi}{2})$:

$$f'(x) = \cos(x) = 0$$

$$\implies x = \frac{\pi}{2}$$

Test the candidates:

$$x = 0, \frac{\pi}{2}, \frac{3\pi}{2}$$

$$f(0) = 0; \ f\left(\frac{\pi}{2}\right) = 1; \ f\left(\frac{3\pi}{2}\right) = -1$$

$$\implies \boxed{\text{Absolute Maximum: } 1; \text{ Absolute Minimum: } -1}$$

Exercise 1

$$g(x) = x^3 - x^2$$

Explain why g satisfies the MVT on $x \in [0, 1]$.

Then, find the x-values that satisfy the conclusion of the MVT on this interval.

Exercise 1 - Solution

$$g'(a) = \frac{g(1) - g(0)}{1 - 0}$$

$$3x^2 - 2x = 0$$

$$x^2 = \frac{2}{3}x$$

$$\boxed{x = 0,\ \frac{2}{3}}$$

Exercise 2

$$h(t) = 2^t$$

Explain why h satisfies the MVT on $t \in [-2, 2]$.

Then, find the t-value that satisfies the conclusion of the MVT on this interval.

Exercise 2 - Solution

$$h'(a) = \frac{h(2) - h(-2)}{2 - (-2)}$$

$$\ln(2)2^t = \frac{2^2 - 2^{-2}}{4}$$

$$\boxed{t = \log_2\left(\frac{\frac{2^2 - 2^{-2}}{4}}{\ln(2)}\right)}$$