Bellwork 11/7

Function g is differentiable.

If $g(3) = 2$ and $g'(3) = -\frac{3}{4}$, estimate $g(2.6)$ using a line tangent to g at $x = 3$.

reset

Bellwork 11/7 - Solution

Find the tangent line:

$$\text{Point-Slope Form: } h(x) - g(3) = g'(3)(x-3)$$

$$h(x) = -\frac{3}{4}(x-3) + 2$$

Use linear approximation:

$$g(2.6) \approx h(2.6) \implies \boxed{g(2.6) \approx -\frac{3}{4}(-0.4) + 2 \approx 2.3}$$

Exercise 1

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

Find the absolute extrema of f for $x \in [-1, 1]$.

Exercise 1 - Solution

Find where critical points occur:

$$f'(x) = 2x - 3x^2 = 0$$

$$2x = 3x^2 \implies x = 0, \frac{2}{3}$$

Test the candidates:

$$x = -1, 0, \frac{2}{3}, 1$$

$$f(-1) = 2; \; f(0) = 0; \; f\left(\frac{2}{3}\right) = \frac{4}{27}; \; f(1) = 0$$

$$\implies \boxed{\text{Absolute Maximum: } 2; \text{ Absolute Minimum: } 0}$$

Exercise 2

$$h(t) = \frac{1}{e^{t^2}}$$

Find the absolute extrema of h for $t \in [-1, 1]$.

Exercise 2 - Solution

Find where critical points occur:

$$h'(t) = -2e^{-t^2}t = 0$$

$$e^{-t^2}t = 0 \implies x = 0$$

Test the candidates:

$$x = -1,\ 0,\ \frac{2}{3},\ 1$$

$$f(-1) = \frac{1}{e};\ f(0) = 1;\ f(1) = \frac{1}{e}$$

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