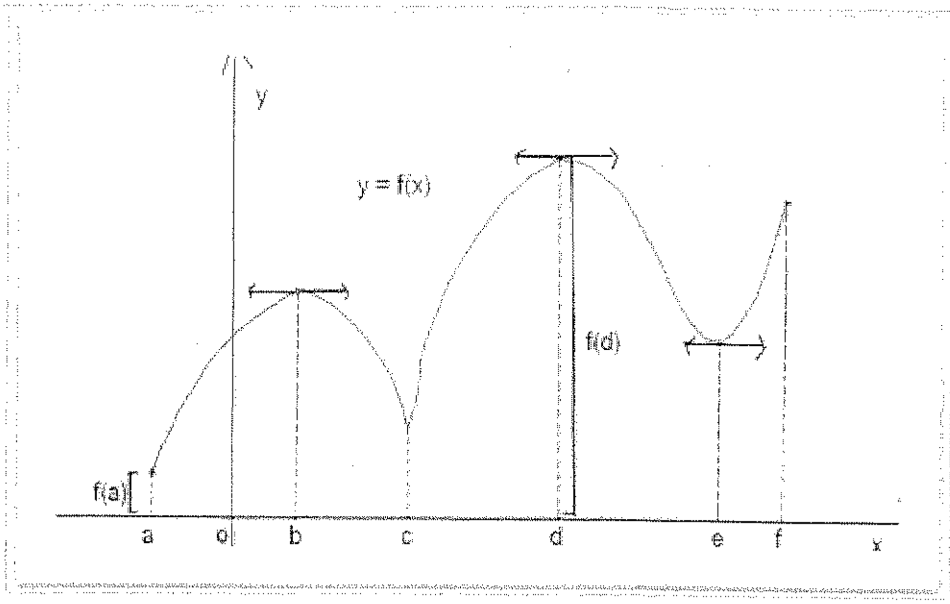
Warm-up: Start of Chapter 3 – Extrema and Critical numbers




1. For the above graph, determine the following:

Critical numbers: $x = b, c, d, e$

Absolute Maximum Value: $f(d)$ Absolute Minimum Value: $f(a)$

x-values of local minima: $x = c$ or $e$ x-values of local maxima: $x = b$ $x = d$

$f'(x) = 0$: $x = b, d, e$ $f'(x)$ does not exist: $x = c$

Intervals where f(x) is increasing: $(a,b) \cup (c,d) \cup (e,f)$

Intervals where f(x) is decreasing: $(b,c) \cup (d,e)$

2. Determine the **critical numbers** of $f(x) = x\sqrt{4-x}$ * domain = $4-x \geq 0$, $x \leq 4$

$$f'(x) = \sqrt{4-x} + \frac{x(-1)}{2\sqrt{4-x}} = \frac{2(4-x)-x}{2\sqrt{4-x}} = \frac{8-3x}{2\sqrt{4-x}} = 0$$

$8-3x=0$

$f'=0 \longrightarrow x = \frac{8}{3}$ $f'$ DNE $\Rightarrow 2\sqrt{4-x} = 0$, $x = 4$

$\boxed{\text{CN: } \frac{8}{3} \text{ and } 4}$

3. Determine the **absolute extreme values** of $f(x) = x^3 - 3x^2 + 4$ on [-2, 3].

① Find crit #s ($f'=0$ or DNE)

② Plug CN and endpts into orig $f(x)$ & compare y values.

$f'(x) = 3x^2 - 6x = 3x(x-2) = 0$

$x=0$ $x=2$ $\Rightarrow$ crit #s

$f(0) = 4$ $f(-2) = -16$ Abs max = 4

$f(2) = 0$ $f(3) = 4$ Abs min = -16