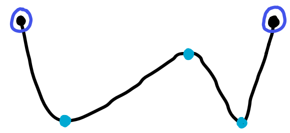
1 Critical Values

critical value: x-coordinate of extreme point (slopes are 0 at min or max points on a smooth curve)

if slope = 0, derivative = 0

Find Critical Values



1. Set $dy/dx = 0$, solve for x
2. Find where dy/dx does not exist. (not in Chapter 6)
3. End points of a given domain (see example)

1. $y = x^2 - 9x + 20$ critical value(s)

1. $dy/dx = 2x - 9$
   $2x - 9 = 0$
   $x = 4.5$

2. Not currently applicable (it does exist)

3. Not currently applicable (no endpoints)

Critical value: $x = 4.5$

Find Extreme Points

1. Find critical value(s).
2. Plug values into original function.

2. $y = x^3 - 6x^2 + 22$ extreme points

1. $dy/dx = 3x^2 - 12x$
   $3x^2 - 12x = 0$
   $x = 0, 4$

2. Not currently applicable (it does exist)

3. Not currently applicable (no endpoints)

$y = 0^3 - 6(0)^2 + 22 \rightarrow (0, 22)$

$y = 4^3 - 6(4)^2 + 22 \rightarrow (4, -10)$

3. $y = 2x^3 - 3x^2 - 12x + 10$ extreme points; domain of $x \in [-4, 4]$

1. $dy/dx = 6x^2 - 6x - 12$
   $6x^2 - 6x - 12 = 0$
   $6(x^2 - x - 2) = 0$
   $x = -1, 2$

2. Not currently applicable (it does exist)

3. Endpoints: $-4, 4$

$y = 2(-4)^3 - 3(-4)^2 - 12(-4) + 10 \rightarrow (-4, -118)$

$y = 2(-1)^3 - 3(-1)^2 - 12(-1) + 10 \rightarrow (-1, 21)$

$y = 2(2)^3 - 3(2)^2 - 12(2) + 10 \rightarrow (2, -10)$

$y=2(4)^3-3(4)^2-12(4)+10 \longrightarrow (4,42)$

4. $y=\frac{1}{3}x^3+\frac{1}{2}x^2-12x+22$ extreme points

1. $dy/dx = x^2+x-12$
   $x^2+x-12=0$
   $x=-4,3$

2. Not currently applicable (it does exist)

3. Not currently applicable (no endpoints)

$y=\frac{1}{3}(-4)^3+\frac{1}{2}(-4)^2-12(-4)+22 \longrightarrow (-4,56\frac{1}{3})$

$y=\frac{1}{3}(-4)^3+\frac{1}{2}(-4)^2-12(-4)+22 \longrightarrow (3,-\frac{1}{2})$

5. $f(x)=x^4-8x^2+12$ extreme points; domain of $x \in [0,10]$

1. $dy/dx=4x^3-16x$
   $4x^3-16x=0$
   $4x(x^2-4)=0$
   $4x(x-2)(x+2)=0$
   $x=\cancel{-2},0,2$

2. Not currently applicable (it does exist)

3. Endpoints: 0, 10

$f(x)=(2)^4-8(2)^2+12 \longrightarrow (0,12)$

$f(x)=(0)^4-8(0)^2+12 \longrightarrow (2,-4)$

$f(x)=(10)^4-8(10)^2+12 \longrightarrow (10,9212)$