4. $f(x) = x^2 - 4x - 32$ $[-4, 8]$ (a, b)

$f(a) = f(-4) = (-4)^2 - 4(-4) - 32$
$= 16 + 16 - 32$
$= 0$

$f(b) = f(8) = 8^2 - 4(8) - 32$
$= 64 - 32 - 32$
$= 0$

ROLLE'S THEOREM

① FIND DERIVATIVE

$f'(x) = 2x - 4$

② SET EQUAL TO ZERO AND SOLVE IT

$2x - 4 = 0$
$2x = 4$
$x = 2$

5. $f(x) = \frac{x^2 - 4}{x + 5}$ $[-2, 2]$ (a, b)

DISC. $x + 5 = 0$, $x = -5$

$f(a) = f(-2) = \frac{(-2)^2 - 4}{-2 + 5} = 0$

$f(b) = f(2) = \frac{2^2 - 4}{2 + 5} = 0$

① $f(x) = \frac{x^2 - 4}{x + 5}$ P, $P' = 2x$; Q, $Q' = 1$

$\frac{P'Q - PQ'}{Q^2}$

$f'(x) = \frac{2x(x+5) - (x^2 - 4)(1)}{(x+5)^2}$

$= \frac{2x^2 + 10x - x^2 + 4}{(x+5)^2}$

$= \frac{x^2 + 10x + 4}{(x+5)^2}$

② $\frac{x^2 + 10x + 4}{(x+5)^2} = 0$

$x^2 + 10x + 4 = 0$

$a = 1$ $b = 10$ $c = 4$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \frac{-10 \pm \sqrt{10^2 - 4(1)(4)}}{2(1)}$

$= \frac{-10 \pm \sqrt{100 - 16}}{2}$

$= \frac{-10 \pm \sqrt{84}}{2}$

$= \frac{-10 \pm \sqrt{2 \cdot 2 \cdot 21}}{2}$

$= \frac{-10 \pm 2\sqrt{21}}{2}$

$= \frac{-5 \pm 1\sqrt{21}}{1}$

$= -5 \pm \sqrt{21}$

$x = -5 + \sqrt{21}$