

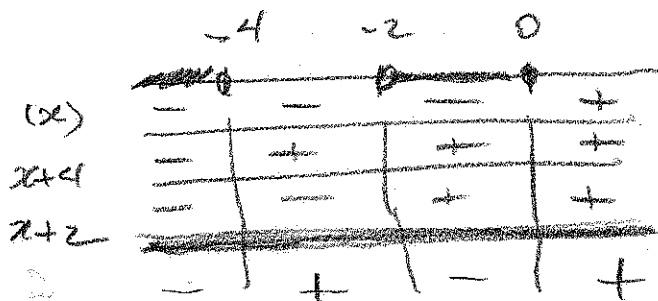
1. Solve the inequality  $\frac{2}{x+2} > \frac{x+2}{2}$ .

$$\frac{x+2}{2} - \frac{2}{x+2} < 0$$

$$\frac{(x+2)^2 - 4}{2(x+2)} < 0$$

$$\frac{x^2 + 4x}{2(x+2)} < 0$$

$$\frac{x(x+4)}{2(x+2)} < 0$$



Solution:

$$x \in (-\infty, -4) \cup (-2, 0)$$

2. Use the method of increments to compute  $\frac{dy}{dx}$  where  $y = \sqrt{x}$ .

$$y_0 + \Delta y = \sqrt{x_0 + \Delta x}$$

$$(y_0 + \Delta y)^2 = x_0 + \Delta x$$

$$y_0^2 + 2y_0\Delta y + (\Delta y)^2 = x_0 + \Delta x$$

$$y_0^2 = x_0$$

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$$2y_0\Delta y + (\Delta y)^2 = \Delta x$$

$$\Delta y(2y_0 + \Delta y) = \Delta x$$

$$\frac{\Delta y}{\Delta x} = \frac{1}{2y_0 + \Delta y} \rightarrow \frac{1}{2y_0} \text{ as } \Delta x \rightarrow 0$$

Thus

$$\frac{dy}{dx} = \frac{1}{2y} = \frac{1}{2\sqrt{x}}$$

3. Solve the inequality  $x^2 - 5x + 2 > 0$ .

$$x^2 - 5x + 2 = 0$$

$$a=1 \quad b=-5 \quad c=2$$

$$x = \frac{5 \pm \sqrt{25 - 8}}{2}$$

$$= \frac{5 \pm \sqrt{17}}{2}$$

$$\left(x - \frac{5 + \sqrt{17}}{2}\right) \left(x - \frac{5 - \sqrt{17}}{2}\right) > 0$$

	$\frac{5 - \sqrt{17}}{2}$		$\frac{5 + \sqrt{17}}{2}$	
$x - \frac{5 + \sqrt{17}}{2}$	-		-	+
$x - \frac{5 - \sqrt{17}}{2}$	-	+	-	+
	+		-	+

Solution:

$$x \in \left(-\infty, \frac{5 - \sqrt{17}}{2}\right) \cup \left(\frac{5 + \sqrt{17}}{2}, \infty\right)$$

4. Use the  $\delta$ - $\epsilon$  definition of limit to verify  $\lim_{x \rightarrow 2} x^2 = 4$ .

Let  $\epsilon > 0$  be arbitrary and choose  $\delta = \min(1, \epsilon/5)$

Then  $0 < |x - 2| < \delta$  implies

$$-1 < x - 2 < 1 \quad \text{so} \quad 3 < x + 2 < 5$$

and therefore

$$|x^2 - 4| = |x - 2| |x + 2| < \delta |x + 2|$$

$$= \delta (x + 2) < 5\delta \leq \epsilon$$