1. Justify

$$\lim_{x\to 5} \frac{x^2 - 6x + 5}{x - 5} = 4$$

using the "Limits don't care about one point" rule.

$$\lim_{x\to 5} \frac{x^2-6x+5}{x-5} = \lim_{x\to 5} \frac{(x-5)(x-1)}{x-5}$$

limits don't care about one point

$$= \lim_{x\to 5} x-1$$

$$= 4$$

2. Compute

$$\lim_{h\to 0} \frac{\sqrt{4+h} - 2}{h}$$

using the "Limits don't care about one point" rule. Hint: Multiply top and bottom by $\sqrt{4+h} + 2$ early in the computation.

$$\lim_{h\to 0} \frac{\sqrt{4+h}-2}{h} = \lim_{h\to 0} \frac{\sqrt{4+h}-2}{h} \frac{\sqrt{4+h}+2}{\sqrt{4+h}+2}$$

$$= \lim_{h\to 0} \frac{(4+h)-4}{h(\sqrt{4+h}+2)}$$

$$= \lim_{h\to 0} \frac{h}{h(\sqrt{4+h}+2)} = \lim_{h\to 0} \frac{1}{\sqrt{4+h}+2} = \frac{1}{\sqrt{4}+2} = \frac{1}{4}$$

limits don't care.

3. Use the squeeze theorem to show

$$\lim_{x\to 0} x \sin\left(\frac{1}{x}\right) = 0.$$

$$-|x| \le x\sin\left(\frac{1}{x}\right) \le |x|$$

$$\left.\begin{aligned} \lim_{x\to 0} |x| &= 0 \\ \lim_{x\to 0} -|x| &= 0 \end{aligned}\right] \xrightarrow{\text{so}} \lim_{x\to 0} x\sin\left(\frac{1}{x}\right) = 0$$