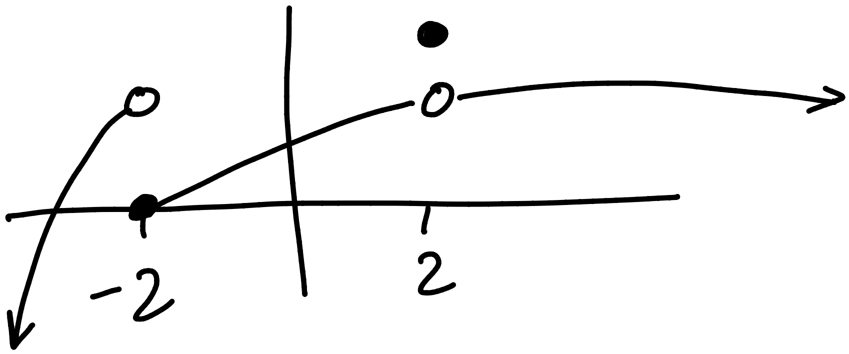
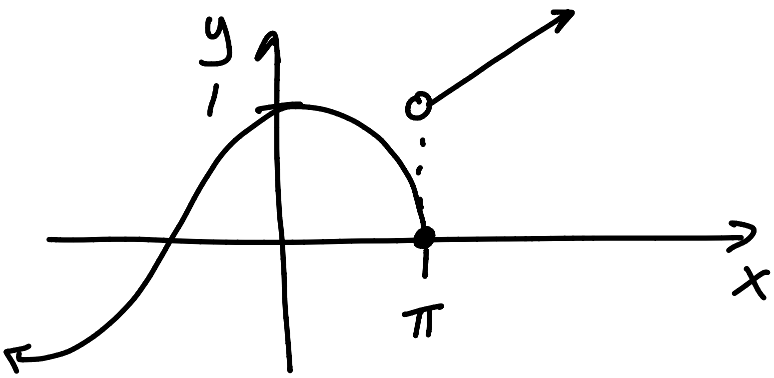
1. Sketch the graph of a function with a removable discontinuity at $x = 2$, a jump discontinuity at $x = -2$ and that is continuous for all other real numbers.



2. Determine where the function $h(x) = \begin{cases} \sin x & x < \pi \\ 0 & x = \pi \\ x + 1 - \pi & \pi < x \end{cases}$ is not continuous and **justify** your answer. Sketch the graph of the function.



f is not continuous at $x=\pi$ because the limit does not exist there.

That is: $\lim_{x \to \pi} f(x) = \text{DNE}$.

3. Use continuity to evaluate the limit $\lim_{x\to 10} \frac{x^2}{\sqrt{x-5}}$. $= \frac{10^2}{\sqrt{10-5}} = \frac{100}{\sqrt{5}}$

4. Determine the value of c that will make $f(x) = \begin{cases} c - x^2 & x \leq 1 \\ 5x - 2 & x > 1 \end{cases}$ continuous everywhere.

at $x=1$: $c-x^2 = c-1$

$5x-2 = 5-2 = 3$

We need $3 = c-1$ or $\underline{\underline{c=4}}$.

Note: f is already continuous for all $x \neq 1$ because $c-x^2$ is everywhere continuous and so is $5x-2$.

5. Use the Intermediate Value Theorem to show that there is a root of the equation $5 + 2x - x^4 = 0$ in the interval $(1, 2)$. Justify your answer.

Let $f(x) = 5+2x-x^4$.

Now, $f(1) = 5+2-1 = 6$ and

$f(2) = 5+4-16 = -7$.

Since $f(x)$ is continuous (it's a polynomial) and $f(1) > 0$ and $f(2) < 0$, $f(x)$ must be zero for some x in $(1,2)$.