

(pg. 8 in packet)

$$1) \lim_{x \rightarrow \pi} \frac{\sin x + \cos x}{2 \cos x} = \frac{1}{2}$$

$$\frac{0 + -1}{2 \cdot -1} = \frac{-1}{-2}$$

$$2) \lim_{\theta \rightarrow 0} \sin \theta \cos \theta = 0$$

0 · 1

$$3) \lim_{\theta \rightarrow \frac{5\pi}{6}} \sin \theta \cos \theta = -\frac{\sqrt{3}}{4}$$
$$\frac{1}{2} \cdot -\frac{\sqrt{3}}{2}$$

$$4) \lim_{\theta \rightarrow \frac{\pi}{2}} \tan \theta \cos^2 \theta \sec \theta = 1$$
$$\frac{\sin \theta}{\cos \theta} \cdot \cancel{\cos^2 \theta} \cdot \frac{1}{\cos \theta}$$

$$5) \lim_{x \rightarrow \pi} \frac{1}{4 \cos x} = -\frac{1}{4}$$
$$\frac{1}{4 \cdot -1}$$

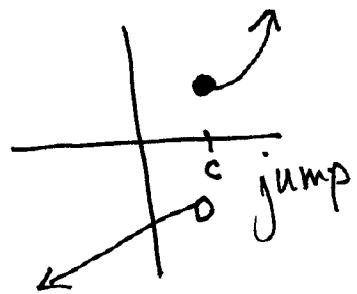
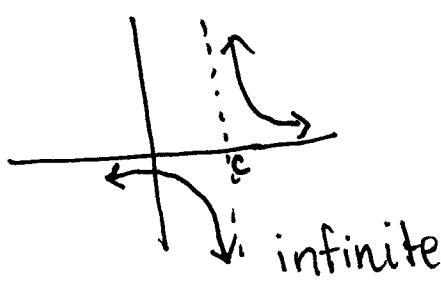
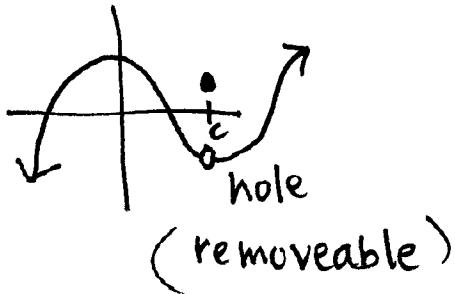
$$7) \lim_{\theta \rightarrow \frac{3\pi}{4}} \cot \theta = -1$$
$$\frac{-\frac{\sqrt{2}}{2}}{\frac{\sqrt{2}}{2}}$$

$$6) \lim_{\theta \rightarrow 0} \tan \theta = 0$$
$$\frac{0}{1}$$

$$8) \lim_{\theta \rightarrow -\frac{\pi}{2}} \sin \theta \cot \theta = 0$$
$$-1 \cdot \frac{0}{1}$$

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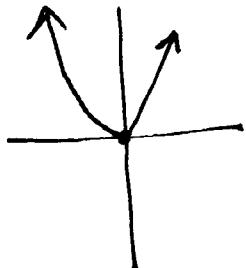
Discontinuities



A function is continuous at a point, $x=c$,

- if:
- 1) $f(c)$ exists (there is a y for $x=c$)
 - 2) $\lim_{x \rightarrow c} f(x)$ exists (show one-sided limits agree)
 - 3) $f(c) = \lim_{x \rightarrow c} f(x)$ (part 1 = part 2)

Ex 1 $f(x) = \begin{cases} x^2, & x \leq 0 \\ 2x, & x > 0 \end{cases}$ Is $f(x)$ cont. at $x=0$? Justify.



- 1) $f(0) = 0^2 = 0$
- 2) $\lim_{x \rightarrow 0^-} f(x) = 0$ $\lim_{x \rightarrow 0^+} f(x) = 0$ $\lim_{x \rightarrow 0} f(x) = 0$
- 3) $f(0) = \lim_{x \rightarrow 0} f(x) = 0$

yes

EX2 $f(x) = \begin{cases} x+1, & x < 2 \\ k(x-5)^2, & x \geq 2 \end{cases}$ where k is a constant.

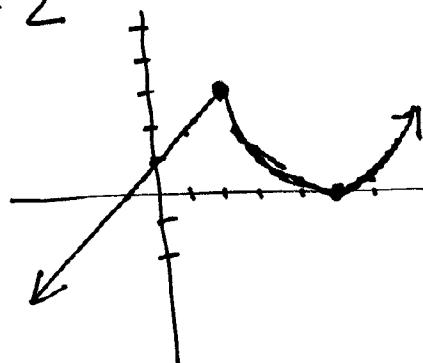
Find $k^{\frac{1}{3}}$ so that $f(x)$ is cont. Sketch $f(x)$.

$$x+1 = k(x-5)^2 \text{ when } x=2$$

$$2+1 = k(2-5)^2$$

$$3 = 9k$$

$$k = \frac{3}{9} = \frac{1}{3}$$



vertical asymptotes

to find: look for zeros of the denom.

to justify: find one-sided limits around the discontin.

EX3 $f(x) = \frac{x^2-9}{x^2+5x+6}$ Find & justify the v.a.

$$f(x) = \frac{(x-3)(x+3)}{(x+3)(x+2)} = \frac{x-3}{x+2} \quad \text{v.a. @ } x=-2$$

$$\left. \begin{array}{l} \lim_{x \rightarrow -2^-} f(x) = \infty \\ \lim_{x \rightarrow -2^+} f(x) = -\infty \end{array} \right\} \lim_{x \rightarrow -2} f(x) = \text{DNE}$$