Ex. 5

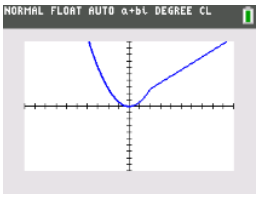
Find k so that $f(x)$ is continuous

$$f(x) = \begin{cases} kx^2, & x \le 2 \\ x + k, & x > 2 \end{cases}$$

$k(2)^2 = 2 + k \Rightarrow 4k = k + 2$

$\Rightarrow 3k = 2$

$\Rightarrow \boxed{k = 2/3}$



$y_1 = \frac{2}{3}x^2(x \le 2) + (x + 2/3)(x > 2)$

Ex. 6

For what values of a and b is the following function continuous at every x?

$$f(x) = \begin{cases} -1 & x \le -1 \\ ax - b & -1 < x < 1 \\ 4 & x \ge 1 \end{cases}$$

$x = -1 \rightarrow a(-1) - b = -1$

$x = 1 \rightarrow a(1) - b = 4$

$-a - b = -1$

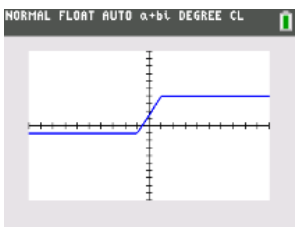
$a - b = 4$

$-2b = 3 \Rightarrow \boxed{b = -\frac{3}{2}}$

$a + \frac{3}{2} = 4$

$a = \frac{8}{2} - \frac{3}{2} = \frac{5}{2}$

$\boxed{a = \frac{5}{2}}$



Y1=(-1)(X≤-1)+(5/2X+3/2)(X>-1)(X<1)+(4)(X≥1)

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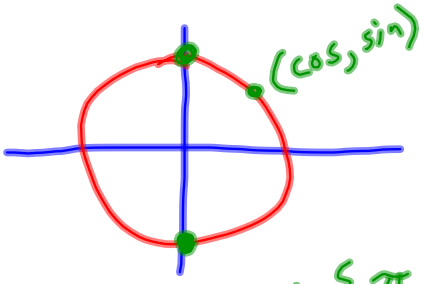
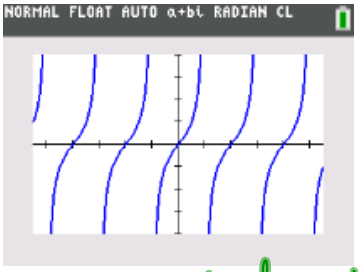
Ex. 7

Where is $f(x) = \tan x$ discontinuous?

$\tan x = \frac{\sin x}{\cos x}$



90°, 270° $\{\frac{\pi}{2}, \frac{3\pi}{2}\}$



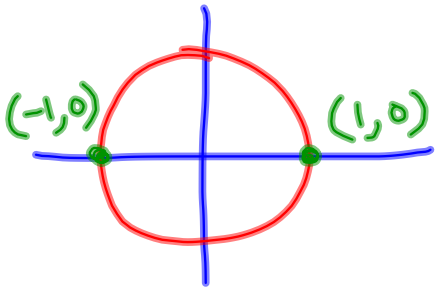
Let k = integer

$(2k+1)\frac{\pi}{2}$

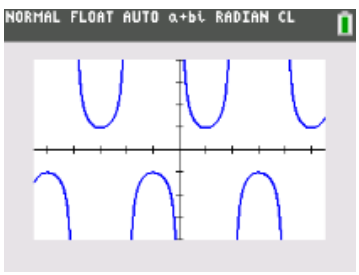
Ex. 8

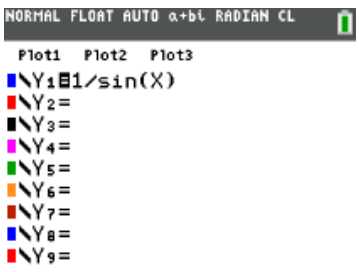
Where is $g(x) = \csc x$ discontinuous?

$g(x) = \frac{1}{\sin x}$



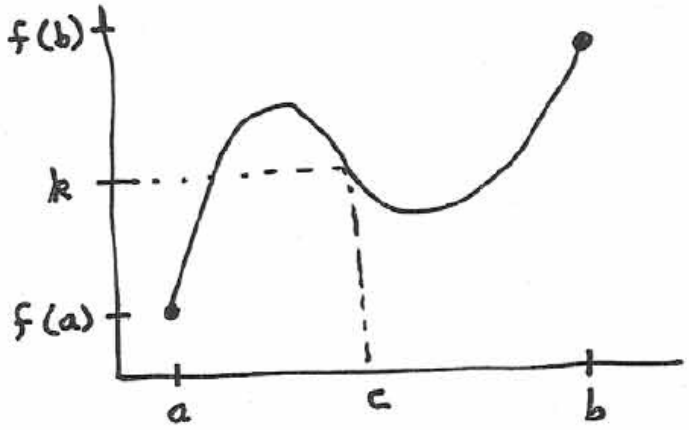
$2k\pi$

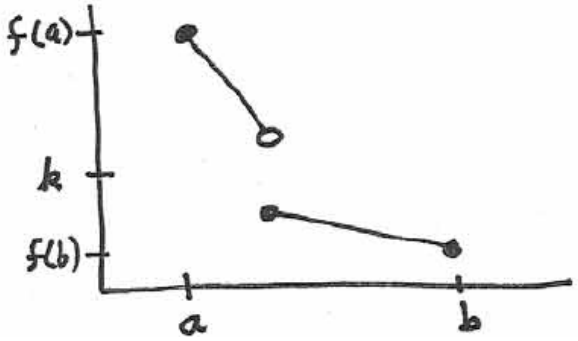




Intermediate Value Theorem: (IVT)

If f is continuous on $[a,b]$ and k is between $f(a)$ and $f(b)$, then there exists c in $[a,b]$ such that $f(c) = k$.





Ex. 8

Is there a zero (root) for $f(x) = x^3 + 3x - 18$ between $x = 2$ and $x = 3$?

Continuous

$f(2) = 8 + 6 - 18 = -4$

$f(3) = 27 + 9 - 18 = 18$

Since 0 is in $(-4, 18)$

there is a number in $(2, 3)$ so that $f(c) = 0$.