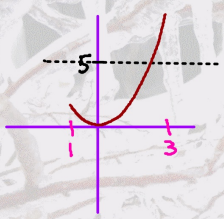
February 12

Give an example of a (non-constant) function that will equal 5 on the interval [-1, 3].



$f(x)=x^2$

$f(-1)=(-1)^2=1$

$f(3)=(3)^2=9$

$f(x)=3x-1$

$f(-1)=3(-1)-1=-4$

$f(3)=3(3)-1=8$

February 12

Students will verbally explain how to

Create Continuous Piecewise Functions

(using the words:
value, continuous, exist...)

solve for k:

$f(x)=\begin{cases} 4x-3 & x<k \\ e^x & x\geq k \end{cases}$

so that f(x) is continuous

$\lim_{x\to k^-} -4x-3 = \lim_{x\to k^+} e^x = f(k)$

$-4x-3=e^x$ (when $x=k$)

$-4k-3=e^k$

$k=-.85619$

$f(x)=\begin{cases} -3x^2+k & x<-1 \\ e^x & x\geq -1 \end{cases}$

$-3x^2+k=e^x$ (when $x=-1$)

$-3(-1)^2+k=e^{-1}$

$-3+k=e^{-1}$

$k=3.3678$

Write an equation of a function with a horizontal asymptote at y = 3.

$x\to\pm\infty$

$\lim_{x\to\infty} f(x)$ "sweep away the crumbs"

$\lim_{x\to\infty} \frac{4x-10x^5}{2x^5+100x^2} = \lim_{x\to\infty} \frac{-10x^5}{2x^5} = -\frac{10}{2} = -5$

H.A. at $y=-5$

$\lim_{x\to\infty} \frac{4x+6x^5}{2x^5+100x^2} = \lim_{x\to\infty} \frac{+6x^5}{2x^5} = 3$

H.A. at $y=3$

Write an equation of a function with a horizontal asymptote at y = 3.

$\lim_{x\to\infty} f(x)$ "sweep away the crumbs"

$\lim_{x\to\infty} \frac{4x-10x^5}{2x^5+19x^2} = \lim_{x\to\infty} \frac{-10x^5}{2x^5} = \frac{-10}{2} = -5$

HA. at $y=-5$

$\lim_{x\to\infty} \frac{4x+9x^5}{3x^5+19x^2} = \lim_{x\to\infty} \frac{9x^5}{3x^5} = \frac{9}{3} = 3$

H.A. at $y=3$

$\frac{4x+6x^5}{2x^5+19x^2}$ $\frac{1}{x}+3$

Roller Coaster Project - Part 1

Create a continuous piecewise function that consists of three different functions, with the following conditions:

- All functions come from different families (power, rational, exponential, trig, etc)
- the limit as x goes to infinity of the last function is 8/ you have a horizontal asymptote at y = 8 (Your last function cannot be y = 8.)
- your function has a y-value of 5 (at least once)
- you may choose an x-value to start your first function
- the domain of your last function must go to infinity

Due on **Tuesday February 25**:

→ your piecewise function
→ algebraic verification that your function is continuous at each domain change
→ verification (written or algebraic) that the limit as x goes to infinity of the last function is 8
→ verification using the Intermediate Value Theorem that your function will equal 5 on some interval.

Helpful strategy:

- - - there are multiple strategies…you don't have to follow the steps below - - -

- determine your last function
  - look at examples of how to find horizontal asymptotes, see if you can modify an equation to get an asymptote of 8
- decide what you want your middle function to be
  - graph your middle and last functions – find their intersection point…this is where your domain will change
- decide what you want your first function to be
  - graph your first and second functions – find their intersection point…this is where your domain will change