Finally figured out where the "Reports" are hidden on ZOOM. No more need for any kind of taking roll. Logging in will suffice.

1.1 - 1,6 sweep, with a bit of 1.7 as time permits.
Test 1 is next week. See Schedule for open test dates: Monday 2/1 - Tuesday 2/7
Midnight, Sunday night until midnight, Tuesday night.

Questions?

Answers about Cengage:

https://www.cengage.com/training/unlimited/

Section 2.1 Assignment FOUND (after teacher wasted time on MAT 122 WebAssign).

Technology!

22. 0/2 points SCalc8 1.2.JIT.006. [3390058]

Use the quadratic formula and a calculator to find all real solutions, correct to three decimals. (If there is no real solution, enter NO REAL SOLUTION.)

$$x^2 - 0.012x - 0.065 = 0$$

Missed the signs.

$1000x^2 - 12x - 65 = 0$

$a = 1000,\ b = -12,\ c = -65$

$b^2 - 4ac \Rightarrow (-12)^2 - 4(1000)(-65)$

$65 \times 4 = 260$

$= 144 + 260000$

$= 260144 \rightsquigarrow \sqrt{b^2-4ac} = 4\sqrt{16259}$

Decomposing a composite integer into primes

$2 \mid 260144 = 2^4 \cdot 16259$ prime factorization.

$2 \mid 130072$

$2 \mid 65036$

$2 \mid 32518$

16259

$2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37$

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{12 \pm 4\sqrt{16259}}{2(1000)}$$

$$= \frac{4(3 \pm \sqrt{16259})}{4(500)} = \frac{3 \pm \sqrt{16259}}{500}$$

$x \approx .2610215677, -.2490215677$

$\approx \boxed{.261, -.249 \approx x}$

21. 0/1 points SCalc8 1.2.JIT.005. [3390125]

Describe the right-hand and left-hand behavior of the graph of the polynomial function. (Select all that apply.)

$$f(x) = 3x^5 + 8x + 9.5$$

$3x^5$

"End behavior"

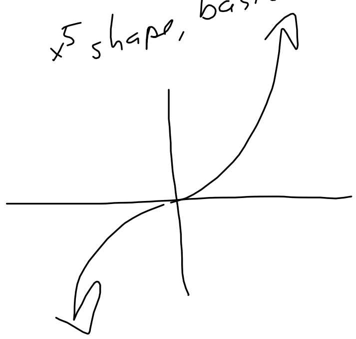
$+$

$-$

$\lim_{x \to \infty} f(x) = +\infty$

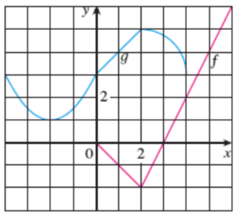
$\lim_{x \to -\infty} f(x) = -\infty$

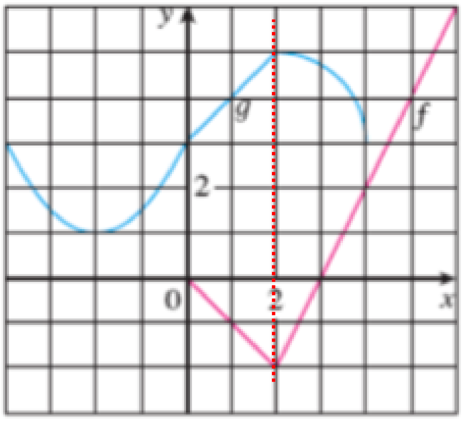
x^5 shape, basically



24. 0/6 points SCalc8 1.3.053. [3354627]

Use the given graphs of *f* and *g* to evaluate each expression, or if t





(a) $f(g(2))$ ✗ 4

(b) $g(f(0))$ ✗ 3

(c) $(f \circ g)(0)$ ✗ 0

(d) $(g \circ f)(6)$ ✗

(e) $(g \circ g)(-2)$ ✗

(f) $(f \circ f)(4)$ ✗ -2

(a) $f(g(2)) = f(5) = \boxed{4 = f(g(2))}$

23. 0/6 points SCalc8 1.3.052. [3354630]

Use the table to evaluate each expression.

x	1	2	3	4	5	6
$f(x)$	1	2	3	6	3	1
$g(x)$	2	6	4	6	5	4

(a) $f(g(1))$ $= f(2) = \boxed{2 = f(g(1))}$

(a) $f(g(1))$ ✗ 2

(b) $g(f(1))$ ✗ 2

(c) $f(f(1))$ ✗ 1

(d) $g(g(1))$ ✗ 6

(e) $(g \circ f)(3)$ ✗ 4

(f) $(f \circ g)(6)$ ✗ 6

Section 1.5

19. 0/1 points SCalc8 1.5.048. [3354355]

In the theory of relativity, the mass of a particle with velocity v is

$$m = \frac{m_0}{\sqrt{1 - v^2/c^2}},$$

Lorentz Transformation.

$$m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$

$$\frac{v^2}{c^2} \xrightarrow{v \to c} 1$$

where m_0 is the mass of the particle at rest and c is the speed of light. What happens as $v \to c^-$?

See today's Maple (210125-maple.pdf) for more background and insight on this key "pathological example."

18. 0/1 points SCalc8 1.5.045. [3394372]

A graphing calculator is recommended.

Graph the function $f(x) = \sin(\pi/x)$ of the example in the viewing rectangle $[-1, 1]$ by $[-1, 1]$. Then zoom in toward the origin several times. Comment on the behavior of this function.

No matter how many times we zoom in toward the origin, the graphs of $f(x) = \sin(\pi/x)$ appear to consist of almost-vertical lines. This indicates more and more frequent oscillations as $x \to 0$.

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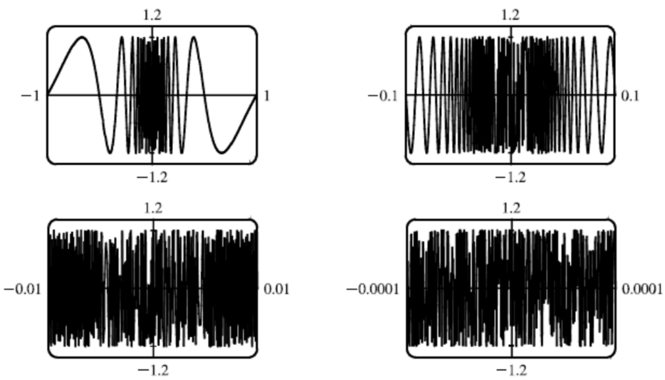


Rather than just blindly plug in numbers, sharpen your college algebra and analytic geometry skills to break it down.

17. 0/2 points SCalc8 1.5.041. [3354111]

Evaluate the function for values of x that approach 1 from the left and from the right.

$$f(x) = \frac{1}{x^3 - 1}$$

$\lim_{x \to 1^-} f(x) =$ ✗ $-\infty$

$\lim_{x \to 1^+} f(x) =$ ✗ ∞

$x^3 - 1 = (x-1)(x^2+x+1)$

$a^3 - b^3 = (a-b)(a^2+ab+b^2)$

$a^3 + b^3 = (a+b)(a^2-ab+b^2)$

$x^3 - 1 = 0$

$x^3 = 1$

$\sqrt[3]{x^3} = x = \sqrt[3]{1} = 1$ $x = 1$ is a sol'n

$x = 1$ is a root ∴ $x - 1$ is a factor.

$x^3 - 1 = x^3 + 0x^2 + 0x - 1$

$$\begin{array}{r|rrrr} 1 & 1 & 0 & 0 & -1 \\ & & 1 & 1 & 1 \\ \hline & 1 & 1 & 1 & 0 \\ & x^2 & x & c & r \end{array}$$

This says $x^3 - 1 = (x-1)(x^2+x+1)$

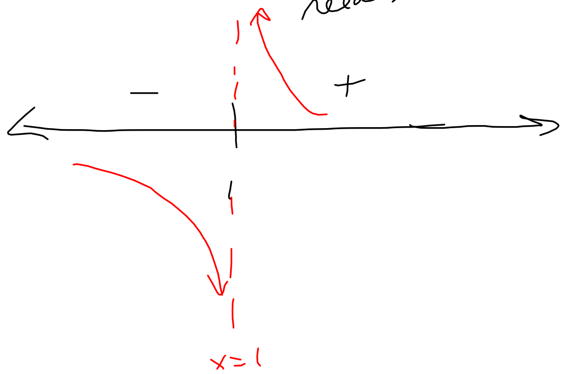
$\frac{1}{(x-1)(x^2+x+1)}$

Doesn't factor over the reals

x^2+x+1 has no real roots.

$a=1, b=1, c=1 \Rightarrow b^2 - 4ac = 1^2 - 4(1)(1)$

$= -3 < 0 \Rightarrow$ No real sol'ns



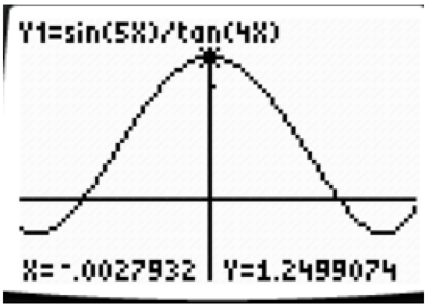
Ugh. Numerical investigations are fine, but tedious. We will be giving you *analytical* tools to handle limits like these in the near future (L'Hopital's Rule).

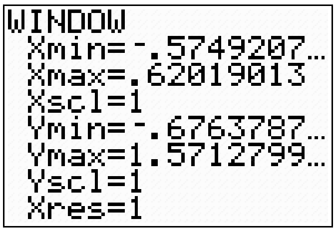
14. 0/1 points SCalc8 1.5.023. [3354340

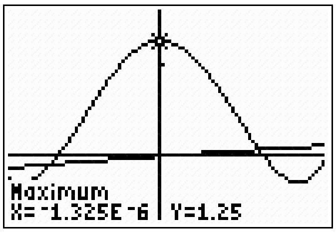
Use a table of values to estimate the value of the limit. If you have a graphing device, use it to confirm your result graphically. (Round your answer to two decimal places.)

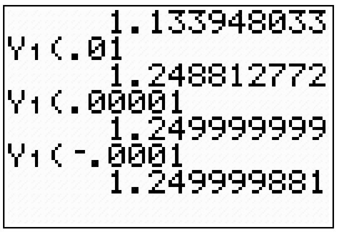
$$\lim_{\theta \to 0} \frac{\sin(5\theta)}{\tan(4\theta)}$$

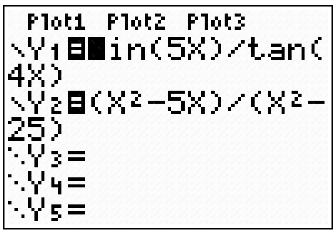
1.25











12. 0/11 points SCalc8 1.5.019. [3354098]

Evaluate the function $f(x)$ at the given numbers (correct to six decimal places).

$$f(x) = \frac{x^2 - 5x}{x^2 - 25},$$

x = 5.1, 5.05, 5.01, 5.001, 5.0001,
4.9, 4.95, 4.99, 4.999, 4.9999

x	$f(x)$
5.1	0.504950
5.05	0.502488
5.01	0.500500
5.001	0.500050
5.0001	0.500005

x	$f(x)$
4.9	0.494949
4.95	0.497487
4.99	0.499499
4.999	0.499950
4.9999	0.499995

```
          .5004995005
Y2(5.1
          .504950495
Y2(5.0001
              .500005
4.9999
               4.9999
```

Here's the hard-core skill:

$$f(x) = \frac{x^2-5x}{x^2-25} = \frac{x\cancel{(x-5)}}{\cancel{(x-5)}(x+5)} = \frac{x}{x+5} \quad (x \neq 5)$$

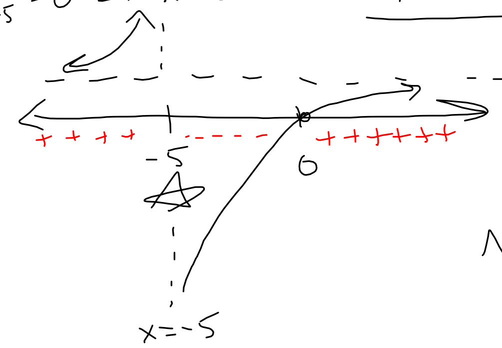
$$\xrightarrow{x \to 5} \quad \frac{5}{5+5} = \frac{5}{10} = \frac{1}{2}.$$

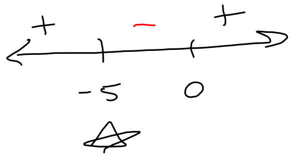
Pass to the limit step.

$\frac{x}{x+5}$ $\quad \mathcal{D} = \mathbb{R} \setminus \{-5\}$ $\quad \boxed{\text{V.A. } x=-5}$

$x \to \pm\infty$: $\frac{x}{x} \to \boxed{y = 1 \text{ is H.A.}}$

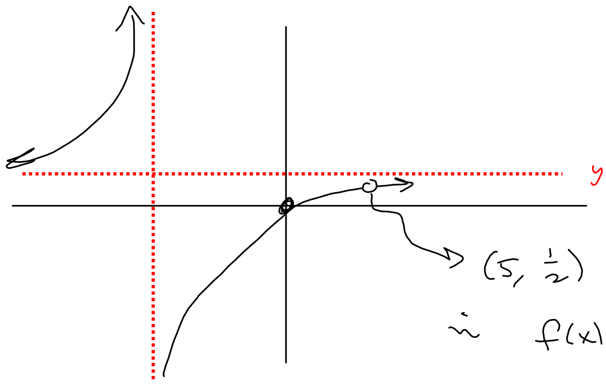
$\frac{x}{x+5} = 0 \Rightarrow x = 0 \rightsquigarrow \boxed{(0,0) \text{ is } x\text{-int}}$





$y = \frac{x}{x+5}$.

Now graph $f(x)$:

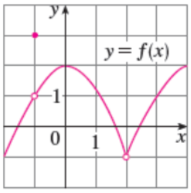


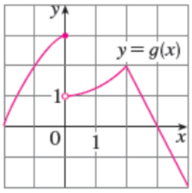
$(5, \frac{1}{2})$ is the hole in $f(x) = \frac{x^2-5x}{x^2-25}$

Section 1.6 Stuff

2. 0/6 points SCalc8 1.6.002. [3354359]

The graphs of f and g are given. Use them to evaluate each limit, if it exists. (If an answer does not exist, enter DNE.)





(a) $\lim_{x \to 2} [f(x) + g(x)] = \lim_{x \to 2} f(x) + \lim_{x \to 2} g(x)$

1

(b) $\lim_{x \to 0} [f(x) - g(x)]$

DNE

(c) $\lim_{x \to -1} [f(x)g(x)] = \lim_{x \to -1} f(x) \lim_{x \to -1} g(x)$

provided both limits exist separately.

2

(d) $\lim_{x \to 3} \frac{f(x)}{g(x)} = \frac{1}{0} \quad \nexists$

DNE

(e) $\lim_{x \to 2} [x^2 f(x)]$

-4

(f) $f(-1) + \lim_{x \to -1} g(x)$

5

Most limits are a matter of plugging in the limiting value. The only ones that require much/any work are those where the limiting value is not in the domain of the function in question (division by zero's the biggest issue.).

3. 0/1 points

Evaluate the limit using the appropriate Limit Law(s). (If an answer does not exist, enter DNE.)

$\lim_{x\to 3} f(x) = \lim_{x \to 3} (5x^3 - 3x^2 + x - 3)$

[ ] 108

$\lim_{x\to 3} f(x) = 5(3)^3 - 3(3)^2 + 3 - 3$

Remainder Theorem!

$$\begin{array}{r|rrrr} 3 & 5 & -3 & 1 & -3 \\ & & 15 & 36 & 111 \\ \hline & 5 & 12 & 37 & 108 \end{array}$$

$108 \to f(3)$

$37 \cdot 3$

9. 0/2 points SCalc8 1.6.010. [3354381]

(a) What is wrong with the following equation?

$$\frac{x^2 + x - 12}{x - 3} = x + 4$$

$$\frac{x^2+x-12}{x-3} = \frac{(x+4)\cancel{(x-3)}}{\cancel{x-3}} = x+4 \quad (x \neq 3)$$

(b) In view of part (a), explain why the equation

$$\lim_{x \to 3} \frac{x^2 + x - 12}{x - 3} = \lim_{x \to 3} (x + 4)$$

The $x=3$ is what we call a "hole" or a "removable discontinuity."

Rationalizing the Denominator trick.

17. 0/3 points SCalc8 1.6.033. [3354477]

A graphing calculator is recommended.

(a) Estimate the value of

$$\lim_{x \to 0} \frac{x}{\sqrt{1 + 9x} - 1} = \lim_{x \to 0} f(x)$$

Look: $x=0 \Rightarrow \frac{0}{\sqrt{1} - 1} = \frac{0}{0}$?!

by graphing the function $f(x) = x/(\sqrt{1 + 9x} - 1)$. (Round your answer to one decimal place.)

0.2

(b) Make a table of values of $f(x)$ for x close to 0 and guess the value of the limit. (Round your answer to six decimal places.)

0.222222

(c) Use the Limit Laws to find the exact value of $\lim_{x \to 0} \frac{x}{\sqrt{1 + 9x} - 1}$.

2/9

$$(a-b)(a+b) = a^2 - b^2$$

$$\frac{x}{\sqrt{1+9x} - 1} = \left(\frac{x}{\sqrt{9x+1} - 1}\right)\left(\frac{\sqrt{9x+1} + 1}{\sqrt{9x+1} + 1}\right) = \frac{x\left(\sqrt{9x+1} + 1\right)}{9x+1 - 1}$$

$$= \frac{x\left(\sqrt{9x+1} + 1\right)}{9x} = \frac{\sqrt{9x+1} + 1}{9} \xrightarrow{x \to 0} \frac{\sqrt{1} + 1}{9} = \frac{2}{9}$$

$$\boxed{\frac{2}{9} = \lim_{x \to 0} f(x)}$$

Graphing piecewise-defined functions is a standard skill.

24. 0/4 points SCalc8 1.6.050. [3354202]

Let

$$f(x) = \begin{cases} x^2 + 1 & \text{if } x < 2 \\ (x - 2)^2 & \text{if } x \geq 2 \end{cases}.$$

$\boxed{x = 2 \text{ is suture point}}$

(a) Find the following limits. (If an answer does not exist, enter DNE.)

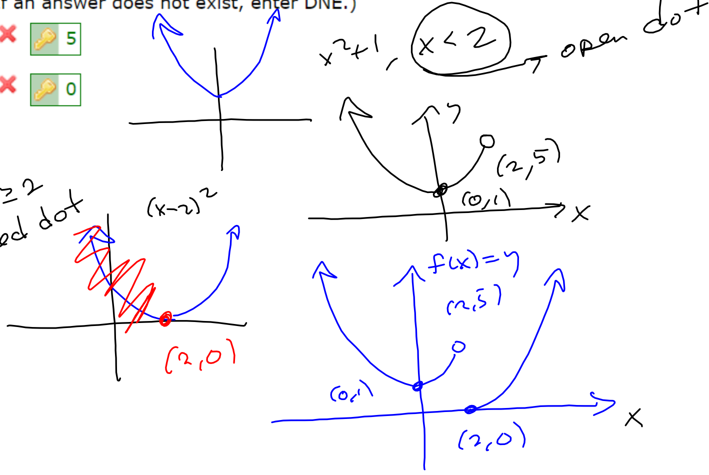
$\lim_{x \to 2^-} f(x) =$ 5 ✗ 5

$\lim_{x \to 2^+} f(x) =$ 0 ✗ 0

(b) Does $\lim_{x \to 2} f(x)$ exist?

- Yes
- No

(c) Sketch the graph of *f*.



PROVE $\lim\limits_{x \to 3} (2x-5) = 1$

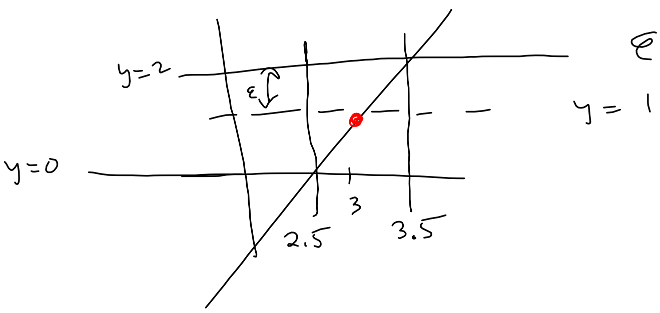
NOTE $m = 2$

§1.7 Stuff!

PROOF: Let $\varepsilon > 0$. Let $\delta = \frac{\varepsilon}{2}$

Then if $0 < |x-3| < \delta$, we have

$|2x-5-1| = |2x-6| = 2|x-3| < 2\delta = 2 \cdot \frac{\varepsilon}{2} = \varepsilon$ ▨



$\varepsilon = 1$.

$\delta = \frac{\varepsilon}{2} = \frac{1}{2}$