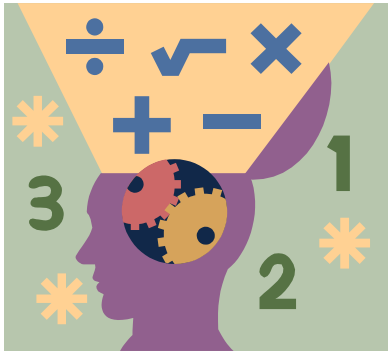
Calculus
Drill on Derivatives!!!!!!!!!!

Derivative Drill & Practice

- I'm going to ask you to remember some derivatives.
- It's important to be fast as time is your enemy on the Exam.
- When you think you know the answer,
- (or if you give up ) click to get to the next slide to see if you were correct.

What's the definition of f '(c)?



There's 2 of them!

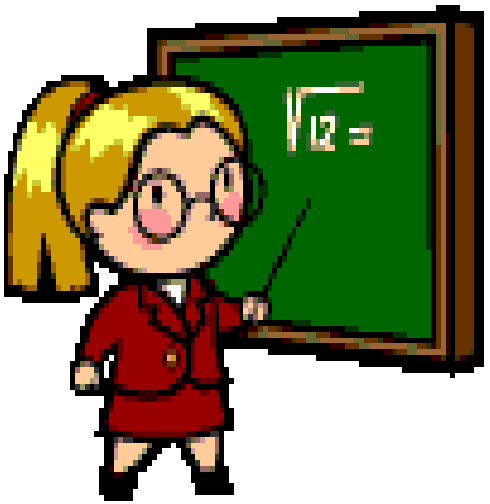
You really need to know both of these thoroughly!

$$\lim(h \to 0)\frac{f(c+h)-f(c)}{h}$$

$$\lim(x \to c)\frac{f(x)-f(c)}{x-c}$$

What's the definition of f '(x)?

This is a bit different…instead of the limit being a number…it will be a function related to f(x)



☺

Got it??

$$\lim(h \to 0)\frac{f(x+h)-f(x)}{h}$$

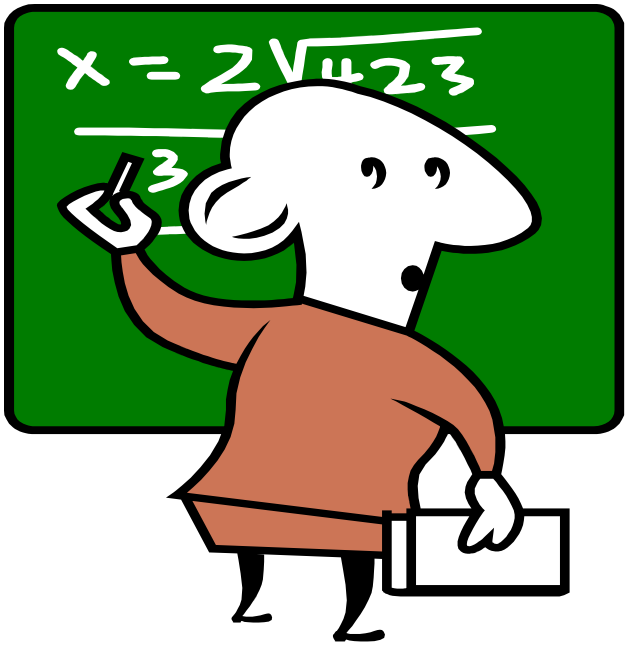
$$\lim(t \to x)\frac{f(x)-f(t)}{x-t}$$

Notice that in the second definition, the arrow points to the independent variable in the final answer.

What does the derivative, f ‘(x) tell you about f(x)?

(There are many answers…

how many do you know?)



Here's a few:

Slope of the curve

Instantaneous rate of change in f(x)

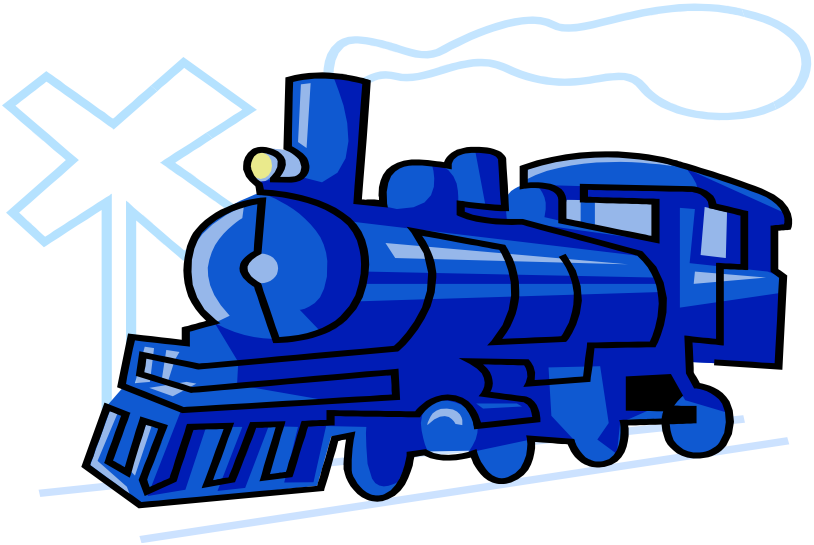
Rate of change

If f(x) is position…then velocity

If f(x) is velocity…then acceleration

Now…

Here come a series of questions concerning basic derivatives you should know very quickly!



Ready?

d/dx(sin(x)) = ??

- What's your answer?

cos(x)

- Were you right?

(click for next question)

$d/dx(mx^n)$

- What's your answer?

mnx^{n-1}

- Were you right?

(click for next question)

$d/dx(e^{f(x)})$

- What is your answer?

$f'(x)\, e^{f(x)}$

- Were you right?

(click for next question)

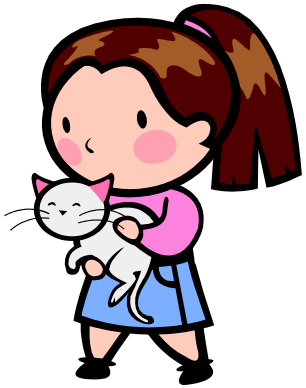
d/dx(ln|x|)

- What is your answer?

1/x

- Were you right?

(click for next question)



$d/dx(a^x)$

- What's your answer…eh?

$(\ln a)\, a^x$

- Were you right?

(click for next question)

I dig this calculus stuff!!

$d/dx\ (\log_a x)$

- What's your answer?

Aghh! Never can remember this one!!!

- Do it this way: $\log_a x = \ln x / \ln a$
  (ln a is just a constant)

so the answer is: $\frac{1}{x \ln a}$

Ready?

d/dx(cos x)

- What's your answer?

(yeah yeah yeah…back to trig!)

- sin x

- Did you remember the “-” ??

Were you right?

(click for next question)

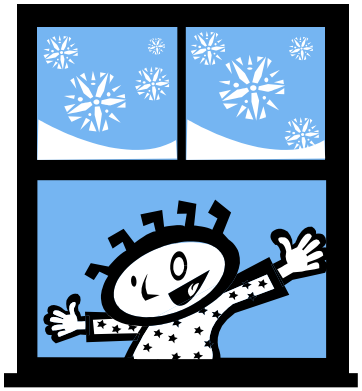
d/dx(tan x)

- Answer it baby!!

$\sec^2 x$

- Were you right?

(click for next question)



d/dx(cot x)

- The ugly step sister!

$-\csc^2 x$

- Ya ya ya!!
- Were you right?

(click for next question)

d/dx(sec x)

- I call this one the challenging derivative!

sec x tan x

- Were you right?

(click for next question)

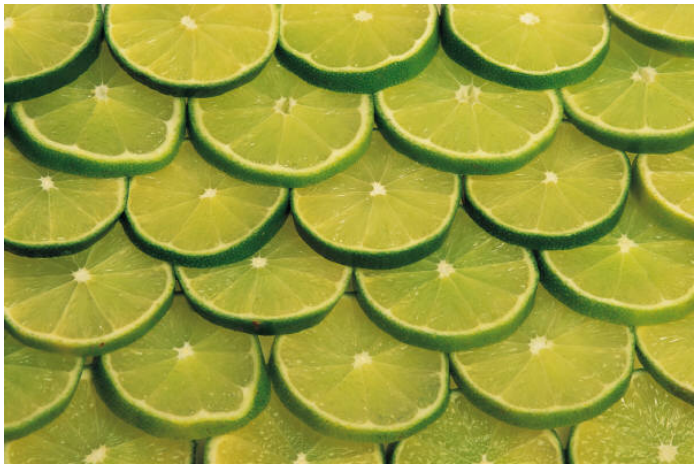
(It’s the TRIG family!!)

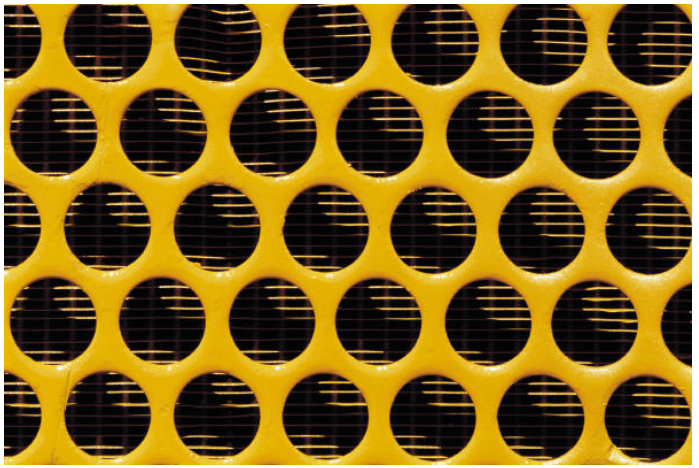
d/dx(csc x)

- Get it done!!!

- csc x cot x

- I think there's a pattern, eh?





(click for next question)

d/dx(ln f(x))

- Ready?

f ‘ (x) / f(x)

- Were you right?

(click for next question)

$d/dx\ (a^{f(x)})$

- Go go go go!!!!!

$(\ln a)\, f'(x)\, a^{f(x)}$

- Were you right?

(click for next question)

Hit that ball!!

$d/dx\ (\tan^{-1}x)$

- Oh yeah! Inverse trig mama!

$1/(1+x^2)$

- Were you right?

(click for next question)

It’s not raining is it?

$d/dx(\sin^{-1}x)$

- You can do this one in your sleep!

- Right?

Did ya get it??

$$\frac{1}{\sqrt{1-x^2}}$$

- Let's keep going!!!

$d/dx(\cos^{-1}x)$

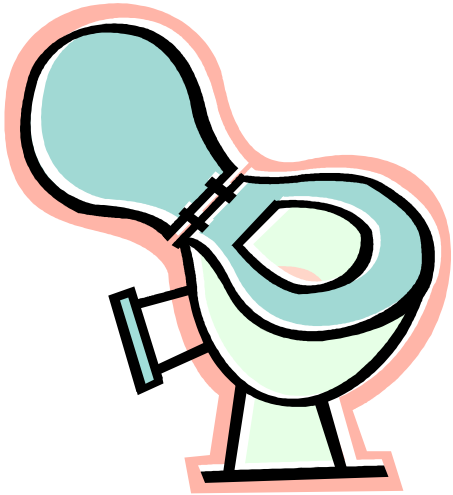
- If you knew the last one, ya know this one…….right??

Oh yeah!

$$\frac{-1}{\sqrt{1-x^2}}$$

d/dx(f(x)g(x))

- It’s the Product Rule!
- (don’t flush it!!!)



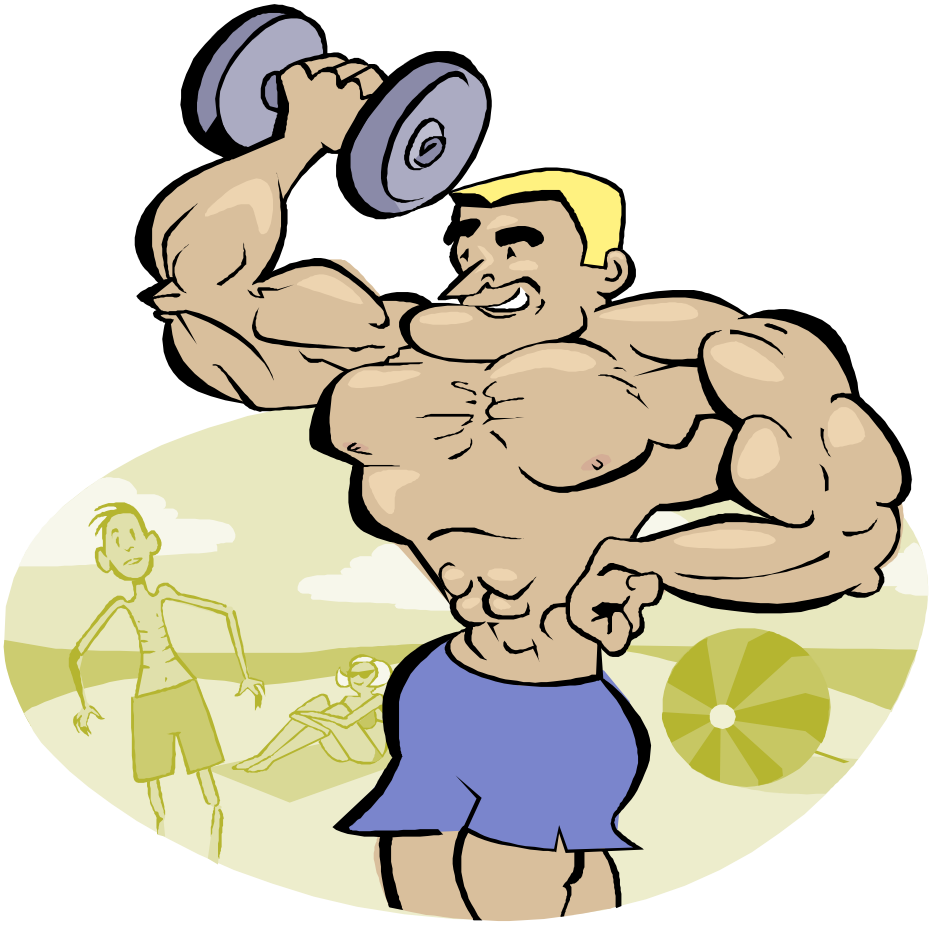
f ’(x)g(x) + f(x)g‘(x)

Yeah…I know you know it…but I’m afraid…

Promise me you will remember to use the product rule every time you take the derivative of a product! OK??

d/dx(f(x)/g(x))

- It’s the merry mighty Quotient Rule!!



Pleeeezzze!
Don’t get the numerator backwards.

$$\frac{g(x)f'(x) - f(x)g'(x)}{(g(x))^2}$$

d/dx(f(g(x)))

Chain chain chain…. ♫

Chain of fooooools! ♪ ♫ ♫

Yeah yeah…you're good now…

But what about that Chain Rule?

$$f'(g(x)) \bullet g'(x)$$

Don't forget all three steps!

1) Derivative of outside
2) Copy inside
3) Multiply by the "derivative of inside"

d/dx(y)

Are you confused yet?

dy/dx

- Did I trick you ?

$d/dx(x^x)$

- Hmmmmm….

Ha ha…I did trick you!

Variable to a variable power - you can't do it…unless you take the natural log first…

$$y = x^x$$

$$\ln y = x \ln x$$

$$(1/y)(dy/dx)=x(1/x)+ 1\ln x$$

$$dy/dx = y(1+\ln x)$$

OK…switching to Related Rates

For the rest of the questions, pretend you are doing a related rates problem.

That is…”t” is the independent variable…

For each expression, give the derivative as you would in a Related Rates problem.

Here we go!!!

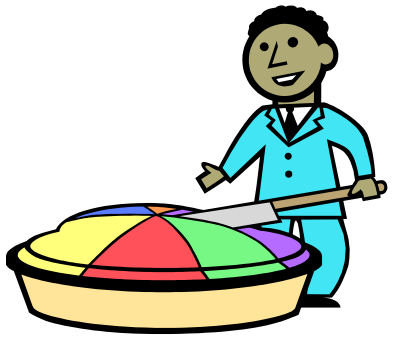
y

dy/dt

Ready to proceed?

Here's a harder one:

$$\pi r^2$$



Did ya get it??

$$2\pi r\left(\frac{dr}{dt}\right)$$

dr/dt is the “baby”…r is the “mama”

xy

Don’t be fooled!!!!

Ya Ya…Product Rule!!

You promised you would not forget!

$$x\,(dy/dt) + y\,(dx/dt)$$

sin x

Whoo whoo dee whoo!!

(cos x) (dx/dt)

Well…did you remember there was a baby?

Last one!

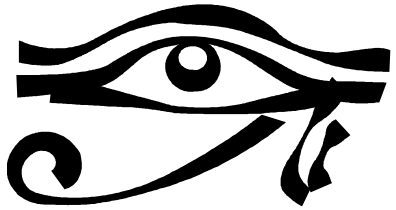
Don’t mess up!

y^2

(2y)(dy/dt)

Yeah! That's it for derivatives!

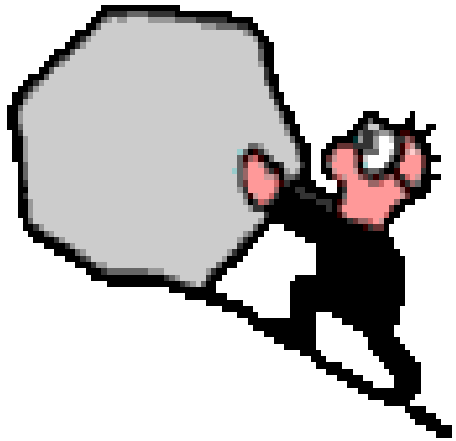
Run this power point again if you are not 100% certain you have mastered derivatives!



Dr. K is

PROUD of ya!

Goodbye!



Be sure to run the power points again and again until you are confident with Derivatives.