WARM UP

Use logarithmic differentiation to find $\frac{dy}{dx}$ for $y = (x-2)^{2x+5}$. Express your answer as a function of x. (6)

$\ln y = \ln (x-2)^{2x+5}$

$\ln y = [(2x+5)][\ln (x-2)]$

$\frac{1}{y} y' = (2x+5)\frac{1}{x-2} + \ln(x-2)(2)$

$y' = y\left[\frac{2x+5}{x-2} + 2\ln(x-2)\right]$

$y' = (x-2)^{2x+5}\left[\frac{2x+5}{x-2} + 2\ln(x-2)\right]$

Apr 28-7:29 PM

$y = \frac{(2x+5)^8(3x-2)^7}{(4x+9)^{10}}$

$\ln y = \ln\left[\frac{(2x+5)^8(3x-2)^7}{(4x+9)^{10}}\right]$

$=$

$y = e^x$

$y' = e^x$

$2.71818...$

$\ln = \log_e$

May 28-10:06 AM

Calculus 120
Unit 5: Odds and Ends

May 28, 2019: Day #1

1. Test Tomorrow

2. Any questions from Sample Exams?

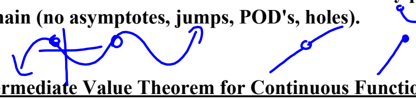
$\ln e$

$\log_e e$

Jan 9-1:43 PM

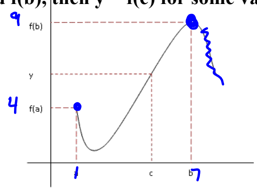
Function Continuity

A function is continuous if it is continuous on every point in its domain (no asymptotes, jumps, POD's, holes).



Intermediate Value Theorem for Continuous Functions

A function that is continous on a closed interval [a, b], takes on every value between f(a) and f(b). In other words, if y is between f(a) and f(b), then y = f(c) for some value of c in [a, b].



May 30-4:10 PM

Ex: Find a value for *a* so that the given function is continuous.

$$f(x) = \begin{cases} 2x+3, & x \le 2 \\ ax+1, & x > 2 \end{cases}$$

$2x+3 = ax+1$

$2(2)+3 = 2a+1$

$7 = 2a+1$

$6 = 2a$

$a = 3$

May 30-4:10 PM

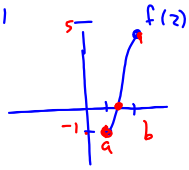
Is there any real number that's exactly 1 less than its cube? Hint, express this situation as a function then find f(1) and f(2).

$x = x^3 - 1$

$0 = x^3 - x - 1$

$f(1) = 1 - 1 - 1$ $\quad$ $f(2) = 8 - 2 - 1$

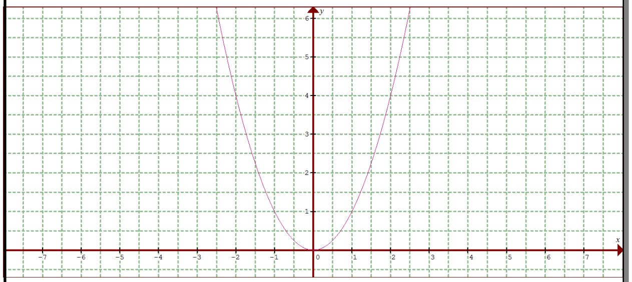
$f(1) = -1$ $\quad$ $f(2) = 5$



May 30-4:10 PM

Intermediate Value Theorem for Derivatives

If a and b are any two points in an interval on which f is differentiable, then f' takes on every value between $f'(a)$ and $f'(b)$.



May 19-8:59 AM

$A^+ = 4.3$
$A = 4.0$
$A^- = 3.7$
$B^+ = 3.3$
$B = 3.0$
$B^- = 2.7$

$C^+ = 2.3$
$C = 2.0$
$D = 1.0$
$F = 0$

Calc = 4 credit hrs
French = 3 credit hrs

A^+ in Calc
$4.3 \times 4 = 17.2$

B^+ in French
$3.3 \times 3 = 9.9$

$\frac{27.1}{7}$

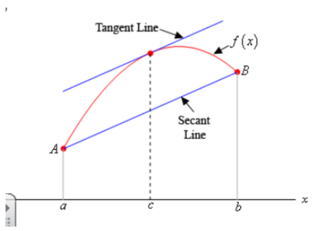
GPA 3.9

May 28-10:29 AM

Mean Value Theorem

If $y = f(x)$ is continuous at every point on the closed interval [a, b], and differentiable at every point of its interior (a, b), then there is at least one point c in (a, b), at which $f'(c) = \frac{f(b)-f(a)}{b-a}$.

In other words, there is a tangent line in the interval that has the same slope as the secant connecting a to b.



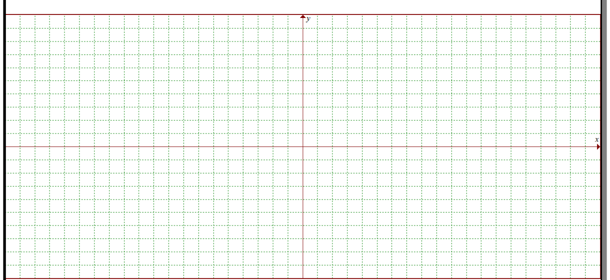
May 19-9:05 AM

May 28-10:40 AM

May 28-10:38 AM

Show that the function $f(x) = x^2$ satisfies the hypotheses of the Mean Value Theorem on the interval [0, 2]. Then find a solution c to the equation $f'(c) = \frac{f(b)-f(a)}{b-a}$ **on this interval.**

Sketch a visual.



May 19-9:15 AM

Explain why each of the following functions fails to satisfy the conditions of the Mean Value Theorem on the interval [-1, 1].

a) $f(x)=\sqrt{x^2}+1$

b) $f(x)=\begin{cases} x^3+3, x<1 \\ x^2+1, x\geq 1 \end{cases}$

May 19-9:20 AM

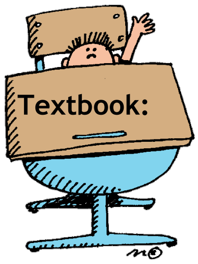
Let $f(x)=\sqrt{1-x^2}$, $A=(-1,f(-1))$ **and** $B=(1,f(1))$. **Find a tangent to** ***f*** **in the interval (-1, 1) that is parallel to the secant** ***AB*****.**

May 19-9:23 AM

Joe left his house at 12:00 and arrived at his destination

200 km away at 2:00. Joe's wife was sleeping for the entire trip. She woke up just as they arrived in town and Joe was driving the 80 km/h speed limit. Joe's wife is a Calculus teacher. How can she use the mean value theorem to prove that Joe must have been speeding?

May 30-9:08 PM



Green Book

p. 206

#1, 3, 5, 7, 9, 10, 11, 12, 13, 14, 15

Jan 13-9:38 PM

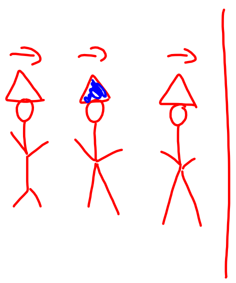
10 x 3 = 30 to Jack

Jack buys paint – cost $25 total $5 change

Jack gives himself : $2 tip
and gives $1 back to each guy. When is the
missing $1.

May 20-1:55 PM

at least 1 white
and at least 1 black



May 20-1:58 PM

11. $f(x) = \frac{x^2}{x^2-4}$ a) $D: (-\infty,-2) \cup (-2,2) \cup (2,\infty)$

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

b) V.A. $x = 2$ or $x = -2$

H.A: $y = 1$

H.A.: $\lim_{x \to \infty} \frac{x^2}{x^2-4} = 1$

V.A: $\lim_{x \to -2^+} \frac{x^2}{x^2-4} \quad \frac{+}{-} \quad -\infty$

-1.999

$\lim_{x \to 2} \frac{x^2}{x^2-4} \quad \frac{+}{-} = -\infty$

c) $f(x) = \frac{x^2}{x^2-4}$

$f'(x) = \frac{(x^2-4)(2x) - x^2(2x)}{(x^2-4)^2}$

$= \frac{2x^3 - 8x - 2x^3}{(x^2-4)^2}$

$f'(x) = \frac{-8x}{(x^2-4)^2}$ $\boxed{\text{DNE @ } x = -2 \text{ or } 2}$

$0 = \frac{-8x}{(x^2-4)^2}$

$0 = -8x$

$x = 0$

	$-8x$	$(x^2-4)^2$	$f'(x)$
$-\infty,-2$	+	+	+ Inc
$-2,0$	+	+	+ Inc
$0,2$	−	+	− Dec
$2,\infty$	−	+	− Dec

Local max

d) $\boxed{\text{local max @ } f(0) = 0}$ $(0,0)$

e) $f'(x) = \frac{-8x}{(x^2-4)^2}$

$f''(x) = \frac{(x^2-4)^{\cancel{2}}(-8) - (-8x)(2\cancel{(x^2-4)})(2x)}{(x^2-4)^{\cancel{4}\,3}}$

$f''(x) = \frac{-8x^2+32 - (-32x^2)}{(x^2-4)^3}$

$f''(x) = \frac{24x^2+32}{(x^2-4)^3}$

$f''(x) = \frac{8(3x^2+4)}{(x^2-4)^3}$ DNE @ $x = \pm 2$

$0 = 8(3x^2+4)$

$0 = 3x^2+4$

$-4 = 3x^2$

$x^2 = \frac{-4}{3}$ no solution

	$3x^2+4$	$(x^2-4)^3$	$f''(x)$
$(-\infty,-2)$	+	−	− CD
$(-2,2)$	+	−	− CD
$(2,\infty)$	+	+	+ CU

May 20-1:52 PM

Attachments

2.1_74_AP.html

2.1_74_AP.swf

2.1_74_AP.html