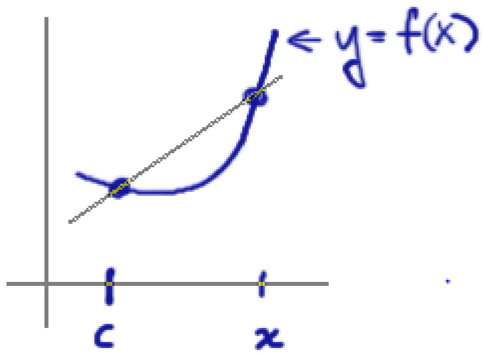
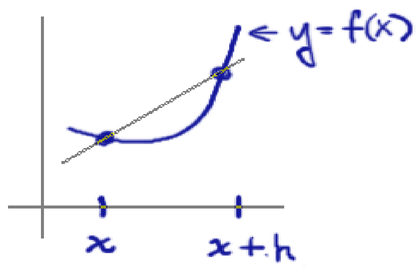
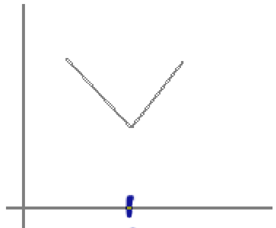
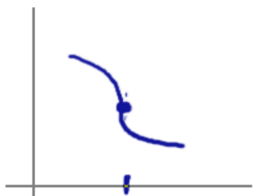
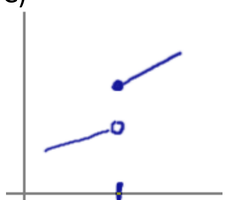
Math 15	**Review for Exam #1 – sections 1.5, 2.1, 2.2, 2.3, 2.4, 3.1**
1	For $f(x) = \frac{x-5}{\sqrt{3-x}}$ find the domain.
2	For the piece-wise defined function $f(x) = \begin{cases} 2x+5, & x<3 \\ 7x+2, & x \geq 3 \end{cases}$, what is $f(-2),\ f(10),\ and\ f(3)$?
Find the limits; if the limit does not exist then explain why.	
3	$\lim\limits_{x\to 1} f(x) = \begin{cases} 2x+5, & x<1 \\ x+6, & x \geq 1 \end{cases}$,
4	$\lim\limits_{x\to 2} f(x) = \begin{cases} 3x+5, & x \neq 2 \\ 7, & x=2 \end{cases}$
5	$\lim\limits_{x\to 3} f(x) = \begin{cases} 2x+1, & x<3 \\ x+5, & x \geq 3 \end{cases}$
6	$\lim\limits_{x\to 3} f(x) = \frac{\lvert x-3 \rvert}{x-3}$
7	$\lim\limits_{x\to 8} f(x) = \frac{\sqrt{x+1}-3}{x-8}$
Determine if the function is continuous at $x=c$.	
8	$f(x) = \frac{5}{x-2}, x=2$ a) continuous b) discontinuous & removable c) discontinuous & non-removable
9	$f(x) = \frac{x-2}{x+5},\ x=2$ a) continuous b) discontinuous & removable c) discontinuous & non-removable
10	$f(x) = \frac{x^2-4}{x-2},\ x=2$ a) continuous b) discontinuous & removable c) discontinuous & non-removable
11	$f(x) = \begin{cases} x+5, & x \leq 2 \\ 3x+4, & x>2 \end{cases} \quad x=2$ a) continuous b) discontinuous & removable c) discontinuous & non-removable
Recall: $f(x)$ is continuous at $x=c$ if $I.\ f(c)\ exists$ $II. \lim\limits_{x\to c} f(x)$ exists $III.\ \lim\limits_{x\to c} f(x) = f(c)$ Circle the roman numerals that are true for $f(x)\ and\ c$.	
12	$f(x) = 3x-2,\ c=5{:}\ I,\ II,\ III$
13	$f(x) = \frac{x-5}{x-2}\ \ and\ c=3{:}\ I, II, III$
14	$f(x) = \frac{x^3-1}{x-1}\ \ and\ c=1{:}\ I,\ II,\ III$
15	$f(x) = \begin{cases} 5x-3, & x<3 \\ x+1, & x \geq 3 \end{cases} \quad and\ c=3{:}\ I,\ II,\ III$
16	Find the one-sided infinite limit: $\lim\limits_{x\to 4^-} \frac{x}{x^2-x-12} =$
17	Find the one-sided infinite limit:

	$\lim_{x\to 2^+} \frac{x}{x^2-5x+6} =$
18	$f(x) = \frac{x^2-4}{x^2+3x-10}$, find the discontinuities. Which are removable?
19	Prove that $x^3 - 2x + 5$ has a zero in the interval $[-3,2]$.
20	For $f(x) = x^2 - 4x + 5$, show that $f(c) = 2$ in the interval $[2,5]$, and find the value of c.
21	Find the vertical asymptotes: $f(x) = \frac{x-2}{x^3+x^2+10x}$
22	Find the slope of the secant line from $x = 2$ to $x = 3$, through the curve given by $f(x) = x^2 - 2x + 5$.
23	Write an expression for the slopes of the secant lines: A)  B) 
24	What is the limit definition of the derivative?
25	A) Use the limit definition of the derivative to find $f'(2)$, where $f(x) = x^2 + 5$. B) Find the equation of the tangent line to $f(x) = x^2 + 5$ at $x = 2$.
26	A) Use the definition of the derivative to find $f'(x), for\ f(x) = x^2 - 2x + 3$. B) Find the point on $f(x) = x^2 - 2x + 3$ where the tangent line is horizontal.
27	Use the alternate definition of the derivative: $f'(c) = \lim_{x\to c} \frac{f(x)-f(c)}{x-c}$ to find $f'(4)$, Where $f(x) = \frac{1}{\sqrt{x}}$.
28	Use the alternate form of the definition of the derivative to show that $f'(2)$ does not exist, for

	$f(x) = (x-2)^{\frac{2}{3}}$.
29	Find a function that is continuous at $x = 0$ but not differentiable at $x = 0$.
30	Does the derivative exist at $x = 2$? A)  B)  C) 

Answers: **1.** $x < 3$ **2.** $f(-2) = 1, f(10) = 72, f(3) = 23$ **3.** 7 **4.** 11 **5.** DNE **6.** DNE **7.** 1/6

8. c **9.** A **10.** B **11.** C **13.** I,II,III **13.** I,II,III **14.** II **15.** I **16.** $-\infty$ **17.** $-\infty$ **18.** $x = -5\ (not\ removable); x = 2\ (removable)$ **19.** $f(x)$ a poly so it is cont. ; $f(-3) = -16, f(2) = 9;\ -16 < 0 < 9\ \ so\ by\ IVT\ there\ exists\ c\ in\ (-3,2) such\ that$

$f(c) = 0$. **20.** $f(x) a\ poly\ so\ it\ is\ cont.$; $1 < 2 < 10;\ \ by\ IVT$ there exists c in (2,5) such that $f(c) = 2;\ \ c = 3$ **21.** $x = 0$ 22. 3 23. $\frac{f(x)-f(c)}{x-c}$ 24. $\frac{f(x+h)-f(x)}{h}$ 25. A) 4 B) $y = 4x + 1$

26. $f'(x) = 2x - 2$ 27. $-1/16$ 28. $\lim_{x\to 2} \frac{(x-2)^{\frac{2}{3}}-0}{x-2} = \lim_{x\to 2} \frac{1}{(x-2)^{\frac{1}{3}}}$ DNE 29. $f(x) = |x|$

30. No,No,No