AP Calculus BC – Unit 1 Extra Practice

1.1 – Extra Practice

Complete the table. Use the result to estimate the limit. Use your calculator to graph the function to confirm your results.

#9b. $\lim_{x\to 0} \frac{\sqrt{x+1}-1}{x}$

x	-0.1	-0.01	-0.001	0	0.001	0.01	0.1
f(x)				?			

#9c. $\lim_{x\to 4} \frac{x-4}{x^2-5x+4}$

x	3.9	3.99	3.999	4	4.001	4.01	4.1
f(x)				?			

#9d. $\lim_{x\to 0} \frac{\cos(x)-1}{x}$

x	-0.1	-0.01	-0.001	0	0.001	0.01	0.1
f(x)				?			

#9e. $\lim_{x\to 0} \frac{\ln(x+1)}{x}$

x	-0.1	-0.01	-0.001	0	0.001	0.01	0.1
f(x)				?			

#9f. $\lim_{x\to 0} \frac{e^x-1}{x}$

x	-0.1	-0.01	-0.001	0	0.001	0.01	0.1
f(x)				?			

Evaluate the limit using any method. Graph in a calculator to verify your result.

#10b. $\lim_{x\to -4} \frac{x+4}{x^2+9x+20}$

#11b. $\lim_{x\to -3} \frac{x^3+27}{x+3}$

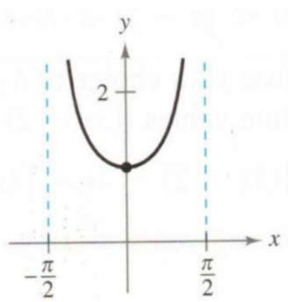
#12b. $\lim_{x\to 0} \frac{\sin(3x)}{x}$

#12c. $\lim_{x\to 0} \frac{5\tan(x)}{\tan(3x)}$

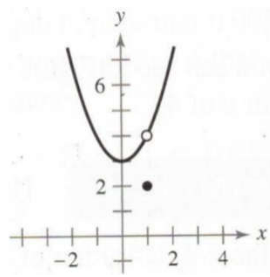
#12d. $\lim_{x\to 0} \frac{\tan(x)}{\tan(2x)}$

Use the graph to find the limit (if it exists). If the limit does not exist, explain why.

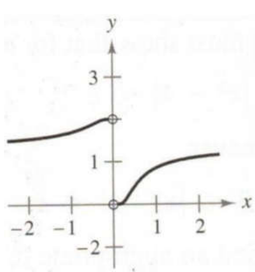
#13b. $\lim_{x\to 0} \sec(x)$



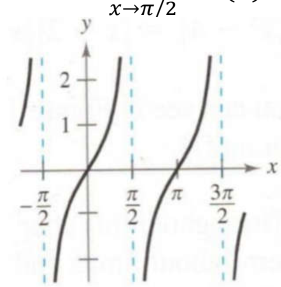
#14b. $\lim_{x\to 1} f(x)$ where $f(x) = \begin{cases} x^2+3 & x \neq 1 \\ 2 & x = 1 \end{cases}$



#15b. $\lim_{x\to 0} \frac{4}{2+e^{1/x}}$



#16b. $\lim_{x\to \pi/2} \tan(x)$



Use the graph of the function f to decide whether the value of the quantity exists. If it does, find it. If not, explain why.

#17b.

a. $f(-2)$

b. $\lim_{x \to 1} f(x)$

c. $f(0)$

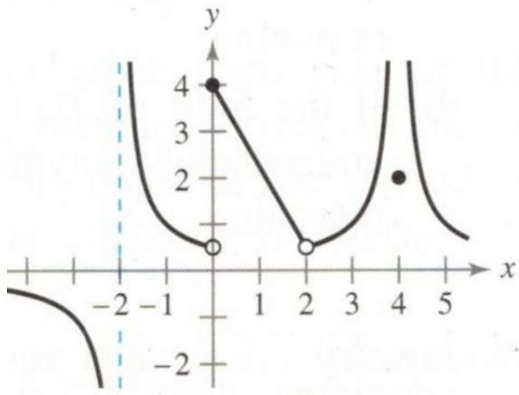
d. $\lim_{x \to 0} f(x)$

e. $f(2)$

f. $\lim_{x \to 2} f(x)$

g. $f(4)$

h. $\lim_{x \to 4} f(x)$



#18 (hint) Remember, it doesn't matter what happens at x = c, what matters is whether or not the value being *approached* is the same from both sides.

#19 (hint) Evaluate the value of *f(x)* and x approaches 1. Then plug this value into the sine function. (There is a limit property which allows this: $\lim_{x \to c} f\left(g\left(x\right)\right) = f\left(\lim_{x \to c} g(x)\right)$

1.2 – Extra Practice

Find the limit. Use a graphing calculator to verify.

#6b. $\lim_{x\to 3} \sqrt{x+1}$

#7b. $\lim_{x\to 3} \tan\left(\frac{\pi x}{4}\right)$

#8b. $\lim_{x\to 1} \frac{e^x}{2x^2-x}$

#9b. $\lim_{x\to 0} \frac{2x}{x^2+4x}$

#10b. $\lim_{x\to 2} \frac{x^2+2x-8}{x^2-x-2}$

#11b. $\lim_{x\to 3} \frac{\sqrt{x+1}-2}{x-3}$

#12b. $\lim_{x\to 0} \frac{3(1-\cos(x))}{x}$

#13b. $\lim_{x\to 0} \frac{(\cos(x))(\tan(x))}{x}$

#14b. $\lim_{x\to 0} \frac{\tan^2(x)}{x}$

#15b. $\lim_{x\to 0} \frac{4\left(e^{2x}-1\right)}{e^x-1}$

Find the limit analytically, then verify by calculator graph.

#16b. $\lim_{t \to 0} \frac{\sin(3t)}{2t}$

#16c. $\lim_{x \to 0} \frac{\cos(x)-1}{2x^2}$

Find $\lim_{\Delta x \to 0} \frac{f(x+\Delta x)-f(x)}{\Delta x}$. Compare the result to the original function…notice anything?

#17b. $f(x) = x^2 - 4x$

#18 (hint) You need to use the Squeeze Theorem to solve this problem.

1.3 – Extra Practice

#6b. Let f be a function defined by $f(x)=\begin{cases} x^2-2, & x<1 \\ -x, & x\geq 1 \end{cases}$

Show that f is continuous at $x=1$.

#7b. $R(t)=\begin{cases} 41\sqrt{\frac{t}{20}} & \text{for } 0\leq t<20 \\ \frac{100t^2+1000}{t^2+600} & \text{for } t\geq 20 \end{cases}$

Is the function R continuous at $t=20$? Justify your answer.

#8b.

$$f(x) = \begin{cases} \frac{x^2+kx-2}{3x^2+4x+3} & \text{for } x < -2 \\ x^3+2 & \text{for } -2 \le x < 0 \\ 0 & \text{for } x = 0 \\ \frac{2e^x}{2-e^x} & \text{for } x > 0 \end{cases}$$

Let f be the function defined above, where k is a constant.

(a) For what value of k, if any, is f continuous at $x = -2$? Justify your answer.

(b) What type of discontinuity does f have at $x = 0$? Give a reason for your answer.

#9b.

t (days)	0	3	7	10	12
$r'(t)$ (centimeters per day)	-6.1	-5.0	-4.4	-3.8	-3.5

An ice sculpture melts in such a way that it can be modeled as a cone that maintains a conical shape as it decreases in size. The radius of the base of the cone is given by a twice-differentiable function r, where $r(t)$ is measured in centimeters and t is measured in days. The table above gives selected values of $r'(t)$, the rate of change of the radius, over the time interval $0 \le t \le 12$.

Is there a time t, $0 \le t \le 3$, for which $r'(t) = -6$? Justify your answer.

1.4 – Extra Practice ** No extra practice for section 1.4 **