Limits Activity – Part 2

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Given the flowing graph of the function *f,* find the following:
	1. $\lim\_{x\to 2^{-}}f\left(x\right)$
	2. $\lim\_{x\to 2^{+}}f\left(x\right)$
	3. $\lim\_{x\to 2}f\left(x\right)$
	4. *f(2)*
	5. $\lim\_{x\to 8^{+}}f\left(x\right)$
	6. $f(8)$
	7. $\lim\_{x\to 8^{-}}f\left(x\right)$

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1. Draw a graph of a function *f* in the axes below that satisfies the following criteria:
* $f\left(-3\right)=1$ and$\lim\_{x\to -3}f\left(x\right)=1$
* $f\left(-1\right)=2$ and$\lim\_{x\to -1}f\left(x\right)=4$
* $f\left(0\right)=-2$,$ \lim\_{x\to 0^{+}}f\left(x\right)=-2$ and$\lim\_{x\to 0^{-}}f\left(x\right)=2$
* $f\left(1\right)=Undefined$ and $\lim\_{x\to 1}f\left(x\right)=2$
* $f\left(3\right)=0$ and$ \lim\_{x\to 3}f\left(x\right)=Undefined$



1. Given that $f\left(x\right)=\frac{x^{2}+x-2}{x^{2}+3x-4}$
	* 1. Find the *x* and *y* intercepts of *f.*
		2. Find the long term behavior of *f* as $x\rightarrow \pm \infty $.
		3. Find the limits from the left and the right for all values of *x* for which *f(x)* is undefined.
		4. Draw a graph of *f* that is consistent with the above.
2. If *x = hours since 12:00* and $f\left(x\right)=x^{2}$ is the mile marker of a car at the time *x.*
	1. Write an expression for the average velocity (slope) on the interval [1,1+h].
	2. Use the formula in a to fill in the following table:

|  |  |
| --- | --- |
| *h* | Average velocity on the interval [1,1+h]. |
| 1 |  |
| .1 |  |
| .01 |  |
| .001 |  |

* 1. Use the table from part b tp guess the value of the limit as h→0 of the average velocity (slope) on the interval [1, 1+h].
	2. Take the limit algebraically as h->0 of the average slope on the interval [1, 1+h] to find the instantaneous slope at x = 1.
1. If *x = seconds* and $f\left(x\right)=100-5x^{2}$ returns the height of an object in meters after x seconds*.*
2. Write an expression for the average velocity on the interval [2,2+h].
3. Use the formula in a to fill in the following table:

|  |  |
| --- | --- |
| *h* | Average velocity on the interval [2,2+h]. |
| 1 |  |
| .1 |  |
| .01 |  |
| .001 |  |

* 1. Use the table from part b tp guess the value of the limit as h→0 of the average velocity (slope) on the interval [2, 2+h].
1. Take the limit algebraically as h->0 of the average slope on [2, 2+h] to find the instantaneous slope at x = 2.
2. For each of the functions and points in parts a,b and c below, perform steps (i) and (ii) to find the instantaneous rate of change (slope) at the indicated point:
	* 1. Write an expression for the average rate of change of *f* on the interval *[a,a+h]* where *a* is the indicated point.
		2. Take the algebraic limit as h->0 of the average slope on [a, a+h] to find the instantaneous slope at the indicated point.
3. $f\left(x\right)=x^{3}, a=2$
4. $f\left(x\right)=2x^{2}, a=3$
5. $f\left(x\right)=3x^{2}+2x+1, a=1$