**2.1 – Worksheet – Day 1**

*All work must be shown and justified in this course for full credit. Insupported answers may receive NO credit.*

1. The only way to guarantee the existence of a limit is to algebraically prove it. Describe the different ways you can investigate the existence of a limit.
2. Using words, explain what is meant by the expression $\lim\_{q\to c}f\left(q\right)=T$.
3. Assume $\lim\_{x\to b}f\left(x\right)=7$ and $\lim\_{x\to b}g\left(x\right)=-3$. Determine:

a) $\lim\_{x\to b}\left(f\left(x\right)+g(x)\right)$ b) $\lim\_{x\to b}\left(f\left(x\right).g(x)\right)$

c) $\lim\_{x\to b}\left(4g(x)\right)$ d) $\lim\_{x\to b}\left(\frac{f\left(x\right)}{g(x)}\right)$
4. When asked to evaluate the limit of a function, what should be done first?
5. Evaluate the following limits by using direct substitution.

a) $\lim\_{x\to 7}\sec(\left(\frac{πx}{6}\right))$ b) $\lim\_{x\to 4}\sqrt[3]{x+4}$

c) $\lim\_{x\to 1/2}3x^{2}(2x-1)$ d) $\lim\_{y\to 2}\frac{y^{2}+5y+6}{y+2}$

e) $\lim\_{x\to -2}\left(x-6\right)^{2/3}$ f) $\lim\_{x\to 2}\sqrt{x+3}$
6. Explain why you cannot use direct substitution to determine each of the following limits.

a) $\lim\_{x\to -2}\sqrt{x-2}$ b) $\lim\_{x\to 0}\frac{1}{x^{2}}$ c) $\lim\_{x\to 0}\frac{(4+x)^{2}-16}{x}$
7. If a limit does not exist, there are 3 possible reasons why. List them all three.
8. Find each limit or explain why the limit does not exist.

a) $\lim\_{x\to 2}f(x)$, if $f\left(x\right)=\left\{\begin{array}{c}lnx for 0<x\leq 2\\x^{2}lnx for 2<x\leq 4\end{array}\right.$ b) $\lim\_{x\to 2^{+}}f(x)$, if $f\left(x\right)=\left\{\begin{array}{c}3x+1 , x<2\\\frac{5}{x+1}, x\geq 2\end{array}\right.$

c) $\lim\_{x\to 1}\frac{x^{2}-4}{x-1}$ d) $\lim\_{x\to 2}\frac{x+1}{(x-2)^{2}}$
9. Determine whether each statement about the graph below is True or False.


10. Use the graph of *f*(*x*) to estimate the limits and value of the function, or explain why the limit does not exist.


11. For each of the following functions, (i) draw the graph, (ii) determine $\lim\_{x\to c^{+}}f(x)$ and $\lim\_{x\to c^{-}}f(x)$, and (iii) explain what the value of $\lim\_{x\to c}f(x)$ is or explain why it doesn’t exist.







12. 

