Math 131 Week in Review Sections 2.1-2.5 J. Lewis

1. The velocity of an object traveling in a straight line is given by $v(t) = 20 - \sqrt{t}$ ft/sec.

Find the average acceleration (average rate of change of velocity) of the object from

a) t=1 to t=4 sec. b) from t=4 to t=7 sec.

Use your calculator to find $\lim_{h \to 0} \dfrac{v(4+h) - v(4)}{h}$.

2. Use the calculator to find the limits.

a) $\lim_{x \to 0} \dfrac{e^x - 1}{x}$ b) $\lim_{h \to 0} \dfrac{(2+h)^5 - 32}{h}$ c) $\lim_{h \to 0} \dfrac{\sqrt{4+h} - 2}{h}$

3. $f(x) = \begin{cases} 4 \sin x & x < 0 \\ \ln(x+1) & 0 \le x < e-1 \\ \dfrac{1}{x} & e-1 \le x \end{cases}$

Find each limit or state DNE for a) $c = 0$ and b) $c = e\text{-}1$

$\lim_{x \to c^-} f(x)$, $\lim_{x \to c^+} f(x)$, $\lim_{x \to c} f(x)$

4. $f(x) = \dfrac{x^2 - 9}{x^2 - x - 6}$ Find the limits $\lim_{x \to c^-} f(x)$, $\lim_{x \to c^+} f(x)$, $\lim_{x \to c} f(x)$. State DNE for any that do not exist.

a) c = 3 b) c = -2

5. Evaluate each limit.

a) $\lim_{x \to 0} \ln |x|$ b) $\lim_{x \to 0} x \ln |x|$ c) $\lim_{x \to \frac{\pi}{2}} e^{\sin x}$

6. Evaluate each limit.

a) $\lim_{x\to\infty} \dfrac{8x^3 - 5x^2 + 65}{x^2 + 9}$

b) $\lim_{x\to-\infty} \dfrac{8x^3 - 5x^2 + 65}{x^2 + 9}$

c) $\lim_{x\to\infty} \left(\sqrt{x^2 + 9x} - x\right)$

d) $\lim_{x\to\infty} \dfrac{5e^x + 7}{4e^x - 2}$

e) $\lim_{x\to-\infty} \dfrac{5e^x + 7}{4e^x - 2}$

7. At what x-values if any is f not continuous? Give a graphical reason and a definition of continuity reason for each discontinuity.

a) $f(x) = \begin{cases} \dfrac{x^2 - 9}{x^2 - x - 6} & x \neq 3, \quad x \neq -2 \\ 1 & x = 3, \quad x = -2 \end{cases}$

b) $f(x) = \begin{cases} \sin\left(\dfrac{1}{x}\right) & x \neq 0 \\ 1 & x = 0 \end{cases}$

c) $f(x) = \begin{cases} x \tan\left(\dfrac{1}{x}\right) & x \neq 0 \\ 0 & x = 0 \end{cases}$

8. $f(x) = \begin{cases} x^2 & x < 1 \\ 3x + b & 1 \leq x \end{cases}$

a) Find the value of *b* so that *f* is continuous at $x = 1$.

b) For the value of *b* found in part a, find the average rate of change of *f(x)* from *x*=0 to *x*=1.

c) For the value of *b* found in part a, find the average rate of change of *f(x)* from *x*=1to *x*=2.

d) Guess $\lim_{h \to 0^-} \frac{f(1+h) - f(1)}{h}$ *and* $\lim_{h \to 0^+} \frac{f(1+h) - f(1)}{h}$. What do you see in the graph at x=1?

9. Find the average rate of change of $f(x) = \sqrt[3]{x}$ from *x*=0 to *x*=1. Does $\lim_{h \to 0} \frac{f(h) - f(0)}{h}$ exist?