# Review #1 – Limits

1) $\lim_{x\to 2} \frac{x-2}{x-2} = \boxed{1}$

2) $\lim_{x\to 5} 2x^2-4x+7 = 50-20+7 = \boxed{37}$

3) $\lim_{x\to 2} \frac{(x-2)(x+3)}{x-2} = \boxed{5}$

4) $\lim_{x\to -\infty} \frac{2x+3}{1-x^2} = \boxed{0}$

5) $\lim_{x\to 9} \frac{x-0}{\sqrt{x}-3}$ FROM LEFT $= -\infty$ FROM RIGHT $= \infty$ $\rightarrow$ LIMIT $\boxed{D.N.E}$

6) $\lim_{x\to 0} \frac{\sin x}{x} = \boxed{1}$

7) $\lim_{x\to 2} \frac{x}{4-x^2} = \frac{2}{\text{SMALL}}$ from LEFT $= \infty$ from RIGHT $= -\infty$ $\rightarrow$ LIMIT $\boxed{DNE}$

8) $\lim_{x\to\infty} \frac{x^2+4}{x-x^2} = \boxed{-1}$

9) $\boxed{D}$

10) $\lim_{x\to 3^+} \frac{x+3}{x-3} = \frac{6}{\overset{+}{\text{small}}} = \boxed{+\infty}$

11) $\lim_{x\to -\infty} \frac{|8x+6|}{4x-2} = \boxed{-2}$

12) $f(x) = \begin{cases} x^2-2, & x<1 \\ \frac{1}{2}x+1, & x\geq 1 \end{cases}$

a) $\lim_{x\to 1^+} f(x) = \frac{1}{2}+1 = \boxed{\frac{3}{2}}$

b) $\lim_{x\to 1^-} f(x) = 1^2+(-2) = \boxed{-1}$

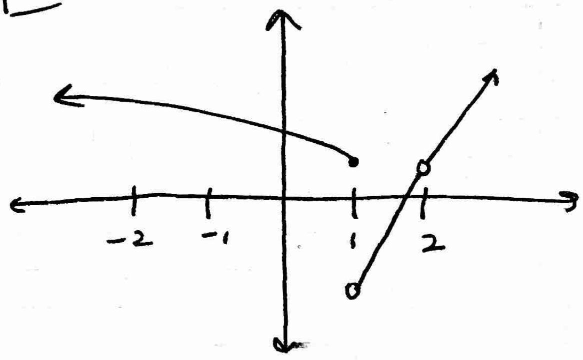
c) $\lim_{x\to 1} f(x)$ $\boxed{D.N.E}$. b/c $\lim_{x\to 1^-} f(x) \neq \lim_{x\to 1^+} f(x)$

13) log $\rightarrow$ power $\rightarrow$ exponential $\rightarrow$ factorial
(growth)

14) $\boxed{C}$

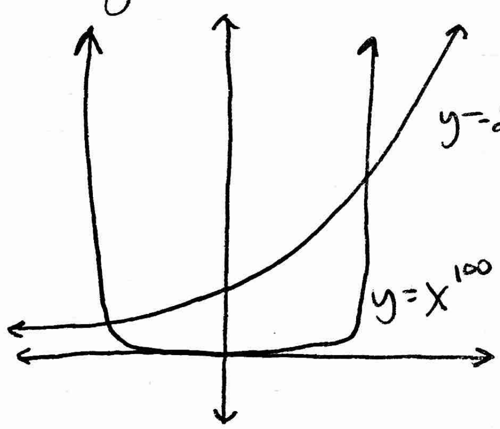
15) $\boxed{E}$

16)




17) $\boxed{D}$ $\lim_{x \to -1} f(x)$ D.N.E.

18) They intersect three times, because eventually, $y = 2^x$ will overtake $y = x^{100}$.




19) a) $\lim_{x \to 1^-} g(x) = 1$ b) $\lim_{x \to 1^+} g(x) = -2$ c) $\lim_{x \to -1} g(x) = 1$ d) $g(1) = -2$

20) a) $\lim_{x \to \infty} \frac{\ln 3x}{x^3} = \boxed{0}$ (order of mag)

b) $\lim_{x \to \infty} \frac{x^{100}}{e^{0.01x}} = \boxed{0}$ (order of mag)

c) $\lim_{x \to \infty} \frac{\sqrt{x}}{x} = \boxed{0}$ (order of mag)

21) a) since $\frac{f(x)}{g(x)}$ is increasing, $\underline{f(x)}$ has the higher order

b) They have the $\underline{\text{same}}$ order

c) $\underline{g(x)}$ must have a higher order

22) $2^x$ and $x^2$ intersect $\underline{\text{three}}$ times

a) Find zeros of $x^2-2^x \rightarrow \{-0.767, 2, 4\}$

b) FIRST region: $\int_{-0.767}^{2}(2^x-x^2)\,dx = 2.10592$

SECOND : $\int_{2}^{4}(x^2-2^x)\,dx = 6.\overline{6}$

TOTAL $=$ $\boxed{8.773 \text{ units}}$

~~2~~ ~~3~~ 23) $f(x)=2xe^{2x}$

a) $\lim_{x\to-\infty} 2xe^{2x} = -\infty \cdot 0$ indeterminate $\rightarrow$ L'Hospital

$= \lim_{x\to-\infty} \frac{2x}{e^{-2x}} = \frac{-\infty}{-\infty}$

$= \lim_{x\to-\infty} \frac{2}{-2e^{-2x}} = \frac{2}{-2(\infty)} = \boxed{0}$

$\lim_{x\to\infty} 2xe^{2x} = \boxed{+\infty}$

b) Abs. max of $f$ $\rightarrow$ does not exist, because the end behavior is unbounded, and we aren't on a closed interval.

Abs $\underline{\text{min}}$ ..

$\rightarrow$

23 continued

$f(x) = 2xe^{2x}$

$f'(x) = 2e^{2x} + 2x \cdot 2e^{2x}$

$f'(x) = 2e^{2x}(1+2x) = 0 \leftarrow$ crit. value

$1+2x = 0$

$x = \frac{-1}{2}$

$f(-\frac{1}{2}) = 2(-\frac{1}{2})e^{-1} = \boxed{\frac{-1}{e}}$

~~This is to~~ This is the absolute minimum because the function has only one critical value on the open interval $(-\infty, \infty)$, and @ this value $x = \frac{-1}{2}$, $f'$ changes from negative to positive.

23c) Range of f: $\boxed{(-\frac{1}{e}, \infty)}$