QSci 291 • answers • Hmwk # 2

Neu (3rd ed), p. 101, sec. 3.1
(Neu (2nd ed), p. 127, sec. 3.1)

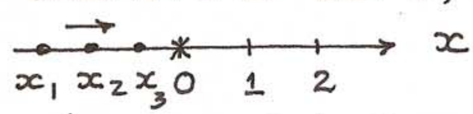
#4) $\lim\limits_{s\to 2} \left[s(s^2-4) \right] = 2(2^2-4) = \boxed{0}$ ans.

#10) $\lim\limits_{x\to 0} \left[\dfrac{e^x+1}{2x+3} \right] = \dfrac{e^0+1}{2(0)+3} = \boxed{\dfrac{2}{3}}$ ans.

#14) $\lim\limits_{x\to 2} \left[\dfrac{x^2-4}{x+2} \right] = \lim\limits_{x\to 2} \left[\dfrac{(x-2)\cancel{(x+2)}}{\cancel{(x+2)}} \right] = 2-2 = \boxed{0}$ ans.

#20) $\lim\limits_{x\to 0^-} (1+e^x) = 1+e^0 = \boxed{2}$ ans.

note: $x \to 0^-$ means x tends to zero from the left of zero, i.e.



for example, $x_1 = -0.1$, $x_2 = -0.01$, $x_3 = -0.001$, $\cdots$

Neu. (2nd ed.): #20) $\lim\limits_{x\to\infty} (e^{-x}) = \lim\limits_{x\to\infty} \left(\dfrac{1}{e^x}\right) = \boxed{0}$ ans

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#28) $\lim\limits_{x\to 0} \left[\dfrac{1-x^2}{x^2} \right] = \lim\limits_{x\to 0} \left[\dfrac{1}{x^2} - 1 \right] = \boxed{\infty}$ ans.

note: technically the limit does not exist!
informally some say the expression $\dfrac{1}{x^2} - 1$ "blows up" as $x \to 0$

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#30) $\lim\limits_{x \to 0} \left[\dfrac{\sqrt{x^2+4} - 2}{x} \right] = \lim\limits_{x \to 0} \left[\dfrac{x}{(\sqrt{x^2+4}+2)} \right] = \dfrac{0}{4} = \boxed{0}$ ans

E.C.E.

note:

$$\frac{(\sqrt{x^2+4}-2)(\sqrt{x^2+4}+2)}{x \cdot (\sqrt{x^2+4}+2)} = \frac{(x^2+4)-4}{x(\sqrt{x^2+4}+2)} = \frac{x}{\sqrt{x^2+4}+2}$$

#48) $\lim\limits_{u \to 3} \left[\dfrac{9-u^2}{3-u} \right] = \lim\limits_{u \to 3} \left[\dfrac{\cancel{(3-u)}(3+u)}{\cancel{(3-u)}} \right] = \boxed{6}$ ans.

Neu (2nd ed): #48) $\lim\limits_{u \to 2} \left[\dfrac{4-u^2}{2-u} \right] = \boxed{4}$ ans

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Neu (3rd ed), p. 113, sec. 3.3.1
(Neu (2nd ed), p. 142, sec. 3.3 1) ⇦

#2) $\lim\limits_{x \to \infty} \left[\dfrac{x^2+3}{5x^2-2x+1} \right] = \lim\limits_{x \to \infty} \left[\dfrac{1 + 3 \cdot \frac{1}{x^2}}{5 - 2 \cdot \frac{1}{x} + \frac{1}{x^2}} \right] = \boxed{\dfrac{1}{5}}$ ans.

E.C.E.

#6) $\lim\limits_{x \to \infty} \left[\dfrac{1-5x^3}{1+3x^4} \right] = \lim\limits_{x \to \infty} \left[\dfrac{(1/x^3)-5}{(1/x^3)+3x} \right] = \dfrac{0-5}{0+3(\infty)} = \boxed{0}$ ans

note: Neu 2nd slightly different

E.C.E.

#8) $\lim\limits_{x \to -\infty} \left[\dfrac{3-x^2}{1-2x^2} \right] = \lim\limits_{x \to -\infty} \left[\dfrac{3\frac{1}{x^2}-1}{\frac{1}{x^2}-2} \right] = \dfrac{-1}{-2} = \boxed{\dfrac{1}{2}}$ ans

E.C.E.