SM 121 LESSON 14 1/2/4/8/11/17

SECTION 2.3 LIMIT LAWS

① GIVEN: $\lim_{x\to 2} f(x) = 4$ $\lim_{x\to 2} g(x) = -2$ $\lim_{x\to 2} h(x) = 0$

a) $\lim_{x\to 2}\left[f(x)+5g(x)\right] = \lim_{x\to 2} f(x) + \lim_{x\to 2} 5g(x) = \lim_{x\to 2} f(x) + 5\lim_{x\to 2} g(x) = 4+5(-2)$
$= \boxed{-6}$

b) $\lim_{x\to 2}\left[g(x)\right]^3 = \left[\lim_{x\to 2} g(x)\right]^3 = (-2)^3 = \boxed{-8}$

c) $\lim_{x\to 2}\sqrt{f(x)} = \sqrt{\lim_{x\to 2} f(x)} = \sqrt{4} = \boxed{2}$

d) $\lim_{x\to 2}\dfrac{3f(x)}{g(x)} = \dfrac{\lim_{x\to 2} 3f(x)}{\lim_{x\to 2} g(x)} = \dfrac{3\lim_{x\to 2} f(x)}{\lim_{x\to 2} g(x)} = \dfrac{3(4)}{-2} = \dfrac{12}{-2} = \boxed{-6}$

e) $\lim_{x\to 2}\dfrac{g(x)}{h(x)} = \dfrac{\lim_{x\to 2} g(x)}{\lim_{x\to 2} h(x)}$ LIMIT DOES NOT EXIST BECAUSE THE DENOMINATOR OF THE LIMIT CANNOT EQUAL ZERO

f) $\lim_{x\to 2}\dfrac{g(x)h(x)}{f(x)} = \dfrac{\lim_{x\to 2}\left[g(x)h(x)\right]}{\lim_{x\to 2} f(x)} = \dfrac{\lim_{x\to 2} g(x)\cdot\lim_{x\to 2} h(x)}{\lim_{x\to 2} f(x)} = \dfrac{(-2)(0)}{4} = \boxed{0}$

② a) $\lim_{x\to 2}\left[f(x)+g(x)\right] = \lim_{x\to 2} f(x) + \lim_{x\to 2} g(x) = 2+0 = \boxed{2}$

b) $\lim_{x\to 1}\left[f(x)+g(x)\right] = \lim_{x\to 1} f(x) + \lim_{x\to 1} g(x) =$ LIMIT DOES NOT EXIST BECAUSE $\lim_{x\to 1} g(x)$ DNE.

c) $\lim_{x\to 0}\left[f(x)g(x)\right] = \lim_{x\to 0} f(x)\cdot\lim_{x\to 0} g(x) = (0)(1.4) = \boxed{0}$

d) $\lim_{x\to -1}\dfrac{f(x)}{g(x)} = \dfrac{\lim_{x\to -1} f(x)}{\lim_{x\to -1} g(x)} =$ DOES NOT EXIST BECAUSE $\lim_{x\to -1} g(x) = 0$ AND THE DENOMINATOR OF THE LIMIT CANNOT EQUAL ZERO

e) $\lim_{x\to 2}\left[x^3 f(x)\right] = \lim_{x\to 2} x^3\cdot\lim_{x\to 2} f(x) = \left(\lim_{x\to 2} x\right)^3\cdot\lim_{x\to 2} f(x) = (2)^3(2) = \boxed{16}$

f) $\lim_{x\to 1}\sqrt{3+f(x)} = \sqrt{\lim_{x\to 1} 3+f(x)} = \sqrt{\lim_{x\to 1} 3 + \lim_{x\to 1} f(x)} = \sqrt{3+1} = \sqrt{4} = \boxed{2}$

LESSON 14

(4) $$\lim_{x\to 2} \frac{2x^2+1}{x^2+6x-4} = \frac{\lim_{x\to 2}(2x^2+1)}{\lim_{x\to 2}(x^2+6x-4)}$$ QUOTIENT LAW

$$= \frac{\lim_{x\to 2} 2x^2 + \lim_{x\to 2} 1}{\lim_{x\to 2} x^2 + \lim_{x\to 2} 6x - \lim_{x\to 2} 4}$$ SUM AND DIFFERENCE LAWS

$$= \frac{2\lim_{x\to 2} x^2 + \lim_{x\to 2} 1}{\lim_{x\to 2} x^2 + 6\lim_{x\to 2} x - \lim_{x\to 2} 4}$$ CONSTANT LAW

$$= \frac{2\left(\lim_{x\to 2} x\right)^2 + \lim_{x\to 2} 1}{\left(\lim_{x\to 2} x\right)^2 + 6\lim_{x\to 2} x - \lim_{x\to 2} 4}$$ EXPONENT LAW

$$= \frac{2(2)^2+1}{(2)^2+6(2)-4}$$ SPECIAL LIMITS

$\lim_{x\to a} c = c \qquad \lim_{x\to a} x = a$

$$= \frac{8+1}{4+12-4}$$

$$= \frac{9}{12}$$

$$= \boxed{\frac{3}{4}}$$

LESSON 14

(8) $\lim_{u \to -2} \sqrt{u^4 + 3u + 6} = \sqrt{\lim_{u \to -2} (u^4 + 3u + 6)}$ ROOT LAW

$= \sqrt{\lim_{u \to -2} u^4 + \lim_{u \to -2} 3u + \lim_{x \to -2} 6}$ SUM LAW

$= \sqrt{\left(\lim_{u \to -2} u\right)^4 + 3 \lim_{u \to -2} u + \lim_{x \to -2} 6}$ EXPONENT LAW, CONSTANT LAW

$= \sqrt{(-2)^4 + 3(-2) + 6}$ SPECIAL LIMITS $\lim_{x \to a} c = c$ $\lim_{x \to a} x = a$

$= \sqrt{16 - 6 + 6}$

$= \sqrt{16}$

$= \boxed{4}$

(11) $\lim_{x \to 2} \frac{x^2 + x - 6}{x - 2} = \lim_{x \to 2} \frac{\cancel{(x-2)}(x+3)}{\cancel{(x-2)}} = \lim_{x \to 2} (x+3) = \lim_{x \to 2} x + \lim_{x \to 2} 3$

$= 2 + 3$

$= \boxed{5}$

(17) $\lim_{h \to 0} \frac{(4+h)^2 - 16}{h} = \lim_{h \to 0} \frac{(16 + 8h + h^2) - 16}{h} = \lim_{h \to 0} \frac{8h + h^2}{h} = \lim_{h \to 0} \frac{\cancel{h}(8+h)}{\cancel{h}}$

$= \lim_{h \to 0} 8 + h$

$= \lim_{h \to 0} 8 + \lim_{h \to 0} h$

$= 8 + 0$

$= \boxed{8}$