Calculus

Assignment

Date_____ Period____

Evaluate each limit.

1) $\lim_{x\to 3}\left(-x^3+14x^2-64x+93\right)$

$= -(3)^3+14(3)^2-64(3)+93$

$= 0$

2) $\lim_{x\to -3} -x$ $\quad -(-3) = 3$

3) $\lim_{x\to -2} -\dfrac{x+1}{x^2+5x+4}$

$-\dfrac{(-2+1)}{(-2)^2+5(-2)+4} = -\dfrac{-1}{-2} = -\dfrac{1}{2}$

4) $\lim_{x\to 3} \sqrt[3]{2x+5}$ $\quad = \sqrt[3]{2(3)+5} = \sqrt[3]{11}$

5) $\lim_{x\to -2} -\sqrt{-2x+2}$

$-\sqrt{-2(-2)+2}$

$= -\sqrt{6}$

6) $\lim_{x\to -3} \sqrt[3]{2x-3}$ $\quad = \sqrt[3]{2(-3)-3} = \sqrt[3]{-9}$

7) $\lim_{x\to 2} \dfrac{x+4}{x^2-x}$ $\quad = \dfrac{2+4}{4-2} = \dfrac{6}{2} = 3$

8) $\lim_{x\to 0} \dfrac{4x}{x^2+4}$ $\quad \dfrac{4(0)}{0^2+4} = \dfrac{0}{4} = 0$

9) $\lim_{x\to 0} \dfrac{3x}{x-3}$ $\quad \dfrac{3(0)}{0-3} = 0$

10) $\lim_{x\to 1} \dfrac{x+1}{x^2+3x+2}$ $\quad = \dfrac{2}{6} = \dfrac{1}{3}$

11) $\lim_{x\to -2} \dfrac{x+2}{x^2+x-2}$ $\quad \dfrac{0}{0} = ???$ $\quad \dfrac{\cancel{(x+2)}}{\cancel{(x+2)}(x-1)} = \dfrac{1}{(x-1)}$

$= \dfrac{1}{-2-1} = -\dfrac{1}{3}$

12) $\lim_{x\to -3} \dfrac{x^2+4x+3}{x+3}$ $\quad \dfrac{\cancel{(x+3)}(x+1)}{\cancel{(x+3)}} = (x+1)$

$-3+1 = -2$

① Always try substituting the x-value you're approaching into the function first!

② If direct substitution doesn't work, try factoring the function, cancel some things, then try sub. again.

③ If you see fractions, use butterfly method, then try sub. again.

④ If you see a radical, rationalize, simplify, then try sub. again.

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13) $\lim_{x\to 3} \frac{x-3}{x^2-4x+3}$ $\quad \frac{\cancel{(x-3)}}{\cancel{(x-3)}(x-1)} = \frac{1}{(x-1)} = \frac{1}{2}$

14) $\lim_{x\to 3} \frac{x-3}{x^2-5x+6}$ $\quad \frac{\cancel{(x-3)}}{\cancel{(x-3)}(x-2)} = \frac{1}{(x-2)} = 1$

15) $\lim_{x\to -1} -\frac{x+1}{x^2+3x+2}$ $\quad \frac{-\cancel{(x+1)}}{\cancel{(x+1)}(x+2)} = \frac{-1}{x+2} = -1$

16) $\lim_{x\to -3} -\frac{x^2-x-12}{x+3}$ $\quad \frac{\cancel{(x+3)}(x-4)}{\cancel{x+3}} = x-4 = -7$

17) $\lim_{x\to 0} \frac{\frac{1}{2+x} - \frac{1}{2}}{x}$ $\quad 2 - (2+x) \quad 4+2x = \frac{\frac{-x}{4+2x}}{x}$

$= \frac{-\cancel{x}}{4+2x} \cdot \frac{1}{\cancel{x}} = \frac{-1}{4+2x} = \frac{-1}{4+2(0)} = \frac{-1}{4}$

18) $\lim_{x\to 0} \frac{\frac{1}{-2+x} + \frac{1}{2}}{x}$ $\quad -2+x \quad -4+2x = \frac{\frac{x}{x}}{-4+2x}$

$= \frac{\cancel{x}}{1} \cdot \frac{-4+2x}{\cancel{x}} = -4+2x = -4+2(0) = -4$

19) $\lim_{x\to -3} \frac{\frac{1}{3} - \frac{1}{3+x}}{x}$ $\quad 3+x \quad 9+3x = \frac{\frac{x}{-x}}{9+3x}$

$= \frac{\cancel{x}}{1} \cdot \frac{9+3x}{-\cancel{x}} = -(9+3x) = -(9+3(-3)) = \boxed{0}$

20) $\boxed{\lim_{x\to 2} \frac{\frac{1}{2} - \frac{1}{-2+x}}{x}}$ $\quad (-2+x) \quad -4+2x$ $\quad \frac{\frac{x}{x}}{-4+2x} = \frac{\cancel{x}}{1} \cdot \frac{-4+2x}{\cancel{x}}$

$= -4+2x$

$= \boxed{0}$

21) $\lim_{x\to 0} \frac{\frac{1}{2} - \frac{1}{2+x}}{x}$ $\quad -2-x \quad 4+2x \quad \frac{\frac{x}{-x}}{4+2x}$

$\frac{\cancel{x}}{1} \cdot \frac{4+2x}{-\cancel{x}} = -(4+2x) = -(4+2(0)) = -4$

22) $\lim_{x\to 3} \frac{\frac{1}{3} - \frac{1}{-3+x}}{x}$ $\quad -3+x \quad -9+3x$ $\quad \frac{\cancel{x}}{1} \cdot \frac{-9+3x}{\cancel{x}} = -9+3x$

$-9+3(3)$

$= \boxed{0}$

23) $\lim_{x\to 2} \frac{\cancel{x-2}}{(\sqrt{x-1}-1)} \cdot \frac{(\sqrt{x-1}+1)}{(\sqrt{x-1}+1)} = \boxed{2}$

$x-1 \quad -1$

$x-1-1 = x-2$

$= \frac{\cancel{(x-2)}(\sqrt{x-1}+1)}{\cancel{(x-2)}} = \sqrt{x-1}+1$

$= \sqrt{2-1}+1$

$= \sqrt{1}+1 = 2$

24) $\lim_{x\to 3} \frac{\sqrt{x+6}-3}{\cancel{x-3}} \cdot \frac{\sqrt{x+6}+3}{\sqrt{x+6}+3} = \boxed{\frac{1}{6}}$

$x+6 \quad -9$

$= \frac{\cancel{(x-3)}}{\cancel{(x-3)}(\sqrt{x+6}+3)}$

$= \frac{1}{\sqrt{x+6}+3} = \frac{1}{\sqrt{3+6}+3} = \frac{1}{6}$

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