Homework questions?

5, 13, 8, 14, 12, 7

8 b) $\lim_{x \to 0} \sqrt{\frac{x+20}{2x+5}}$

$= \sqrt{\frac{20}{5}}$

$= 2$

13 $(1,-2)$
$(-1,4)$

$m = \frac{4-(-2)}{-1-1}$

$= \frac{6}{-2}$

$= -3$

$y = mx+b$

sub $m=-3$ & $(1,-2)$

14 $y = ax^2+bx+c$

$(0,0)$ $(1,5)$ $(-2,8)$

$0 = a(0) + b(0) + c$

1 $0 = c$

$5 = a(1) + b(1) + c$

2 $5 = a + b + c$

$8 = a(-2)^2 + b(-2) + c$

3 $8 = 4a - 2b + c$

1.2 Properties of Limits

For any real number "a", f and g are functions that have limits at x=a:

1. $\lim\limits_{x \to a} k = k$ for any constant k

What does the function look like?

2. $\lim\limits_{x \to a} x = a$

3. $\lim\limits_{x \to a} \left[f(x) \pm g(x) \right] = \lim\limits_{x \to a} f(x) \pm \lim\limits_{x \to a} g(x)$

junk

4. $\lim\limits_{x \to a} \left[c \cdot f(x) \right] = c \left[\lim\limits_{x \to a} f(x) \right]$, for any constant c

5. $\lim\limits_{x \to a} \left[f(x) g(x) \right] = \left[\lim\limits_{x \to a} f(x) \right] \left[\lim\limits_{x \to a} g(x) \right]$

junk

6. $\lim\limits_{x \to a} \dfrac{f(x)}{g(x)} = \dfrac{\lim\limits_{x \to a} f(x)}{\lim\limits_{x \to a} g(x)}$, provided that $\lim\limits_{x \to a} g(x) \neq 0$

7. $\lim\limits_{x \to a} \left[f(x) \right]^n = \left[\lim\limits_{x \to a} f(x) \right]^n$, for any rational number n

$\left[\lim\limits_{x \to a} f(x) \right]$

Eg. 1 Use the properties of limits to evaluate.

a) $\lim_{x \to -2} \left(2x^3 - 7x + 4\right)$

$= \lim_{x \to -2} 2x^3 - \lim_{x \to -2} 7x + 4$

$= -16 + 14 + 4$

$= 2$

b) $\lim_{x \to 1} \left[-2(x-3)^2 + 4\right]$

$= -2\left[\lim_{x \to 1} x - 3\right]^2 + 4$

$= -2\left[-2\right]^2 + 4$

$= -4$

☆☆ If *f(x)* is a polynomial, then $\lim_{x \to a} f(x) = f(a)$ ☆☆

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

$= \dfrac{\lim_{x \to 3} 3x^2 - x + 4}{\lim_{x \to 3} 2x - 3}$

$= \dfrac{28}{3}$

d) $\lim_{x \to 8} \sqrt[3]{5x^2 - 18x - 8}$

$= \sqrt[3]{\lim_{x \to 8} 5x^2 - 18x - 8}$

$= \sqrt[3]{168}$

$= \sqrt[3]{8 \cdot 21}$

$= 2\sqrt[3]{21}$

- In all of the above cases the limit can be found by direct
- substitution... the function is continuous at the limit value so $\lim_{x \to a} f(x) = f(a)$
- When direct substitution of x = a results in $\frac{0}{0}$ this is called an indeterminate form.

When this happens we look for an equivalent function that has all the same values as f(x) except at x=a.

When direct substitution fails try:

1. Factoring

a) $\lim_{x\to 3}\frac{x^2+x-12}{2x^2-5x-3}$

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

M -6
A -5

$\frac{2}{-6}$ $\frac{2}{1}$

$\frac{1}{-3}$

$= \frac{7}{7}$

$= 1$

b) $\lim_{x\to 2}\frac{x^3-8}{x-2}$

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

$= 12$

2. Rationalizing

a) $\lim_{x\to 9}\frac{\sqrt{x}-3}{x-9} \cdot \frac{\sqrt{x}+3}{\sqrt{x}+3}$

$= \lim_{x\to 9}\frac{\cancel{x-9}}{\cancel{(x-9)}(\sqrt{x}+3)}$

$= \frac{1}{3+3}$

$= \frac{1}{6}$

b) $\lim_{x\to 0}\frac{\sqrt{5+x}-\sqrt{5-x}}{x}$

Or force it to factor!

$$\lim_{x\to 9}\frac{\sqrt{x}-3}{x-9} = \lim_{x\to 9}\frac{\sqrt{x}-3}{(\sqrt{x}-3)(\sqrt{x}+3)}$$

$$= \lim_{x\to 9}\frac{1}{\sqrt{x}+3}$$

$$= \frac{1}{\sqrt{9}+3}$$

$$= \frac{1}{6}$$

Stop here for today!

Partial Homework
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