1.4#1

Questions?

5	10	15	20	25	30
694	444	250	111	28	0

$P(15, 250) = (x_1, y_1)$

$Q_1(5, 694) = (x_2, y_2)$

a) Boring

$m_1 = \frac{694-250}{5-15} = \frac{444}{-10} = -4.44 = m_1$

$m_4 = m_{PQ_4}$ $Q_4(25, 28)$

$m_2 = m_{PQ_2}$ $Q_2(10, 444)$

$m_3 = m_{PQ_3}$ $Q_3(20, 111) = \frac{111-250}{20-15} = \frac{-139}{5} = \boxed{-27.8 = m_3}$

b) Best estimate for m @ P(15, 250) is the average of m_2 & m_3 $\frac{m_2+m_3}{2}$

Quiet, Alex.

$m_2 = \frac{444-250}{10-15} = \frac{194}{-5} = \boxed{-39.8 = m_2}$

444
−250

$\frac{m_2+m_3}{2} = \frac{-39.8-27.8}{2}$

c)

Boooooring.

Carefully, with some care for the scale. Tedious & unsatisfying.

Draw the picture

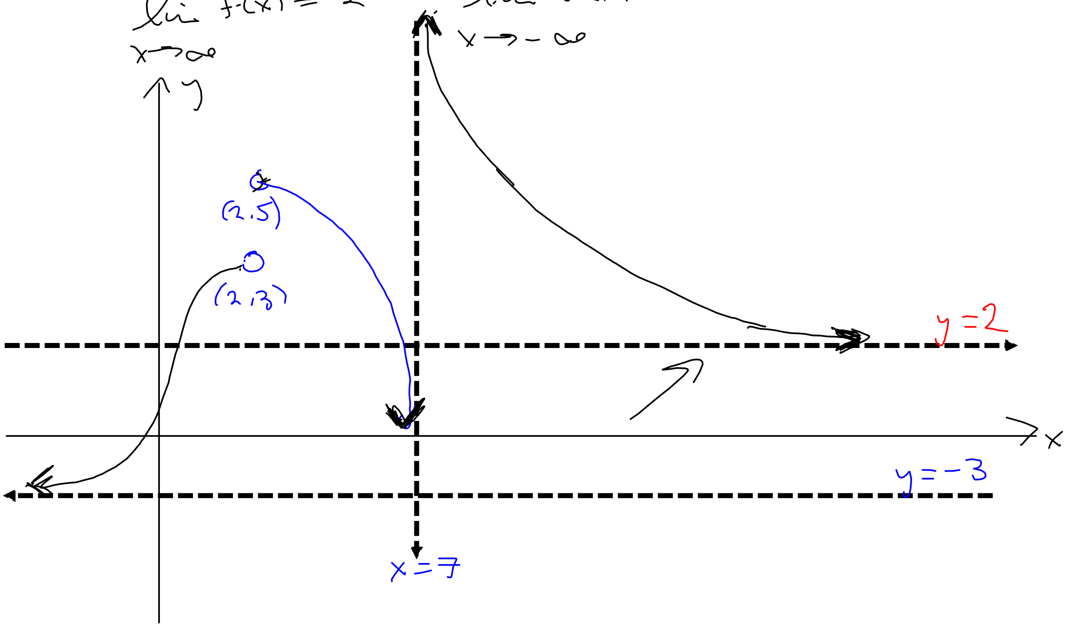
$\lim_{x\to 2^-} f(x) = 3$, $\lim_{x\to 2^+} f(x) = 5$

STA

$\lim_{x\to 7^-} f(x) = -\infty$, $\lim_{x\to 7^+} + \infty$

"show the approach."

$\lim_{x\to\infty} f(x) = 2$, $\lim_{x\to -\infty} f(x) = -3$



Practical limits Plug in values very close to the limiting value. This works when the limit exists & misleads when the limit $\nexists$.

Plug in $x = 1.999$

$$\lim_{x\to 2} \frac{x^3+8x^2+x-42}{x^2+5x-14} = \lim_{x\to 2} h(x)$$

Graphing Calculator or WolframAlpha.org (.com)?

$h(1.999) \approx 4.999000$

$h(2.001) \approx 5.001000$

$\lim_{x\to 2} h(x) = 5$

$h(2) = \frac{\sim\sim}{0}$, $\nexists$

Not continuous @ $x = 2$

$$h(x) = \frac{x^3+8x^2+x-42}{x^2+5x-14}$$

$x=2$ is a zero of the denominator.

FACTOR Numer. & Denom. $(x+7)(x-2)$

$$\begin{array}{r|rrr} 2 & 1 & 5 & -14 \\ & & 2 & 14 \\ \hline & 1 & 7 & 0 \end{array}$$

This says $x^2+5x-14 = (x-2)(x+7)$

Now, IF $\lim_{x\to 2} h(x) \exists$, then $x=2$ is a zero of the numerator, as well! Let's see:

Divide x^3+8x^2+x-42 by $x-2$:

$$\begin{array}{c|cccc} 2 & 1 & 8 & 1 & -42 \\ & & 2 & 20 & 42 \\ \hline & 1 & 10 & 21 & 0 \end{array}$$

So $h(x) = \dfrac{(x-2)(x^2+10x+21)}{(x-2)(x+7)}$

$$= \frac{x^2+10x+21}{x+7} \quad (x \neq 2) \xrightarrow{x \to 2} \frac{2^2+10(2)+21}{2+7} = \frac{4+20+21}{9}$$

$$= \frac{45}{9} = 5 = \lim_{h \to 2} h(x)$$

Sketch the situation: $h(x) = \dfrac{x^2+10x+21}{x+7} = \dfrac{\cancel{(x+7)}(x+3)}{\cancel{x+7}}$, $x \neq 2$

$= x+3$, $x \neq 2, -7$

$y = x+3$ with 2 holes