HW 4 #7

$$f(x) = \frac{x^2 - 7x + 12}{x^3 - 5x^2 + 3x + 9} \rightarrow (x-3)(x-4)$$

Rational Root Theorem

$p \leftarrow$ factors of 9 $\leftarrow$ 1, -1, 3, -3, 9, -9

$q \leftarrow$ factors of 1 $\leftarrow$ 1, -1

$\boxed{1, -1, 3, -3, 9, -9}$

$x^3 - 5x^2 + 3x + 9$

$$\begin{array}{r|rrrr} 3 & 1 & -5 & 3 & 9 \\ & \downarrow & +3 & -6 & -9 \\ \hline & 1 & -2 & -3 & \boxed{0} \end{array}$$

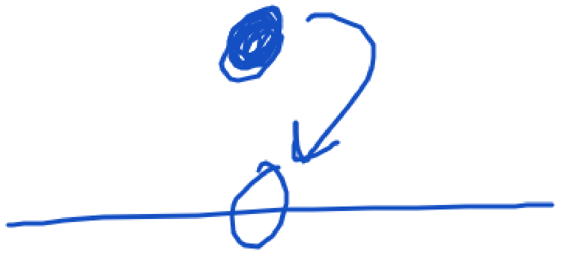
$(x-3)(x^2 - 2x - 3)$

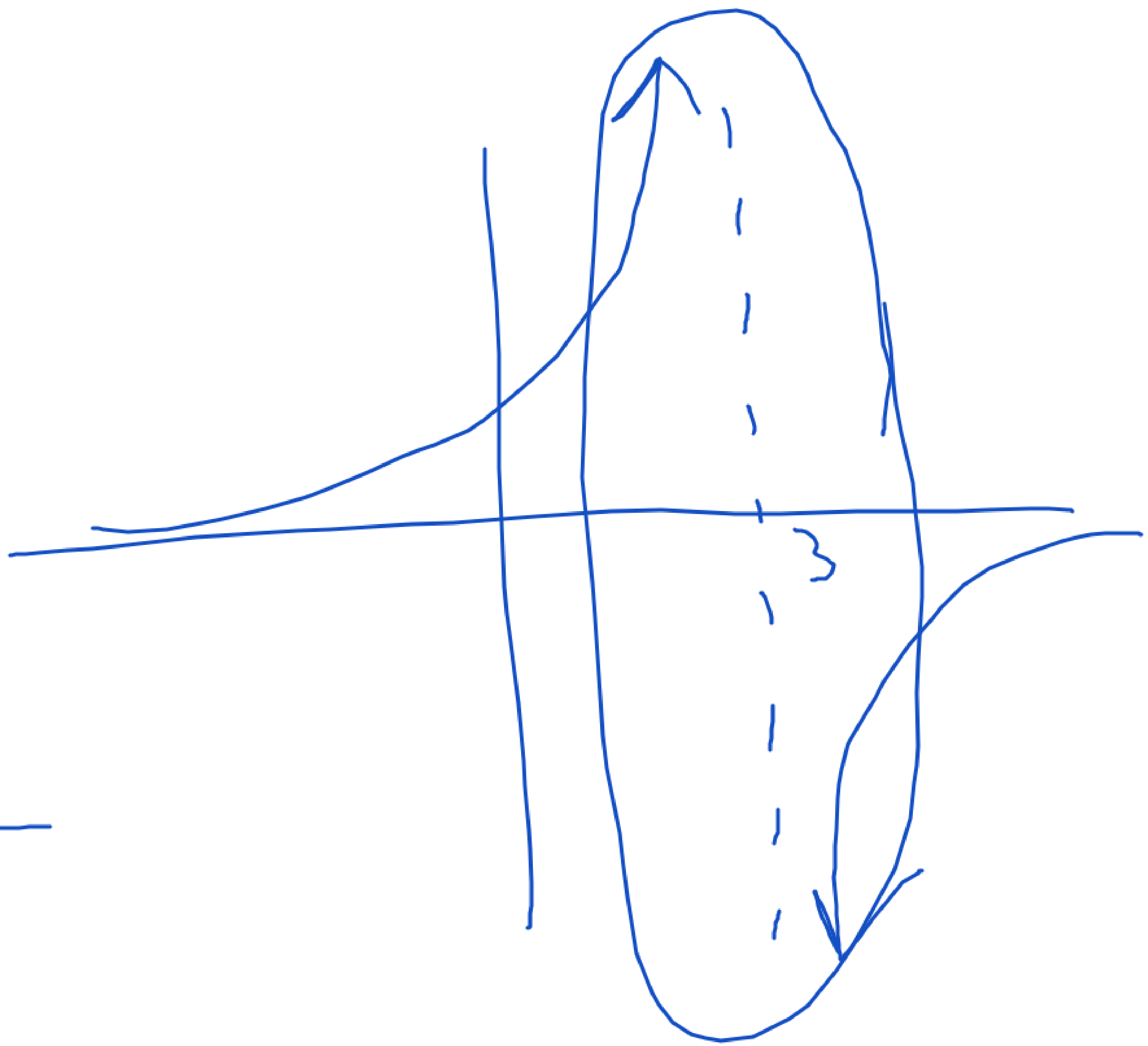
$(x-3)(x-3)(x+1)$

$$\frac{\cancel{(x-3)}(x-4)}{\cancel{(x-3)}(x-3)(x+1)}$$

$$\frac{(x-4)}{(x-3)(x+1)}$$

V.A. $\boxed{x=3}$ $\boxed{x=-1}$

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$$\lim_{x\to\infty} \frac{x^2-7x+12}{x^3-5x^2+3x+9} \qquad \frac{x^2}{x^3} \to y=0$$

$$\lim_{x\to\infty} \frac{\frac{x^2}{x^3}-\frac{7x}{x^3}+\frac{12}{x^3}}{\frac{x^3}{x^3}-\frac{5x^2}{x^3}+\frac{3x}{x^3}+\frac{9}{x^3}} \to$$

$$\lim_{x\to\infty} \frac{\frac{1}{x}-\frac{7}{x^2}+\frac{12}{x^3}}{1-\frac{5}{x}+\frac{3}{x^2}+\frac{9}{x^3}} \to \frac{0-0+0}{1-0+0+0} = \frac{0}{1} = \boxed{0}$$

0

0 0 0

$\boxed{s(t) = 7t + 1}$

$\overset{a}{t=1}, \overset{b}{t=3}$

avg. vel.

$$\frac{s(b)-s(a)}{b-a} = \frac{s(3)-s(1)}{3-1}$$

$s(3) = 21+1 = 22$

$s(1) = 7+1 = 8$

$$\frac{22-8}{2} = \frac{14}{2} = \boxed{7}$$

$s(t) = 7t + 1$

instantaneous velocity $t = 2$

$$\boxed{\lim_{h \to 0} \frac{s(2+h) - s(2)}{h}} \rightarrow \boxed{\lim_{h \to 0} \frac{7h + \cancel{15} - \cancel{15}}{h}}$$

$s(2+h) = 7(2+h) + 1 = 14 + 7h + 1 = 7h + 15$

$s(2) = 7(2) + 1 = 15$

$$\lim_{h \to 0} \frac{7h}{h} \rightarrow \lim_{h \to 0} 7 = \boxed{7}$$

$s(t) = \underline{t^2} + 1$

$t = 1$

$\lim_{h \to 0} \frac{s(1+h) - s(1)}{h} \to \boxed{\lim_{h \to 0} \frac{h^2 + 2h + \cancel{2} - \cancel{2}}{h}}$

$s(1+h) = (1+h)^2 + 1 = 1 + 2h + h^2 + 1 = h^2 + 2h + 2$

$s(1) = (1)^2 + 1 = \underline{2}$

$\lim_{h \to 0} \frac{h^2 + 2h}{h}$

$\lim_{h \to 0} h + 2 \to \boxed{2}$