

Cumulative Review #5

- ① Let $x = \#$ people on trip
 $y =$ cost per person if everybody goes

$(x-5) =$ the # of people after 5 drops out
 $(y+1.50) =$ new fare

situation #1: $xy = 540 \rightarrow x = \frac{540}{y}$

situation #2: $(x-5)(y+1.50) = 540$

Solve the system: $(\frac{540}{y} - 5)(y+1.50) = 540$

$$540 - 5y + \frac{810}{y} - 7.5 = 540$$

$$-5y^2 - 7.5y + 810 = 0$$

$$-5(2y^2 + 3y - 324) = 0$$

$$-5(2y + 27)(y - 12) = 0$$

$$y = -\frac{27}{2} \quad | \quad y = 12$$

omit \uparrow

original fare \$12

$$xy = 540$$

$$x(12) = 540$$

$$x = 45$$

So, 40 people on trip.

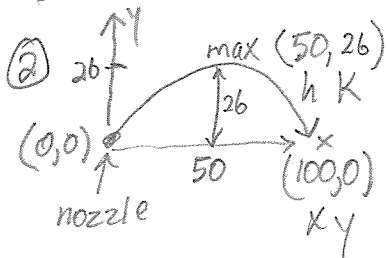
ck:

$$12(45) = 540$$

$$(13.5)(40) = 540$$

or use: $\frac{540}{x} + 1.50 = \frac{540}{x-5}$

\uparrow 1st fare \uparrow new fare



$$y = a(x-h)^2 + k$$

$$0 = a(100-50)^2 + 26$$

$$\frac{-26}{2500} = a$$

$$a = -\frac{13}{1250}$$

$$y = -\frac{13}{1250}(x-50)^2 + 26$$

- ③ How far = find zeros.

$$y = -0.0196x^2 + 1.37x$$

$$0 = -196x^2 + 13700x$$

$$0 = -4x(49x - 3425)$$

$$x=0 \quad \left\{ \quad x = \frac{3425}{49} \approx 69.8979$$

About 70 miles
 or 69.9

shell's max height = find vertex

$$x = \frac{-1.37}{2(-0.0196)} \Rightarrow 34.9489$$

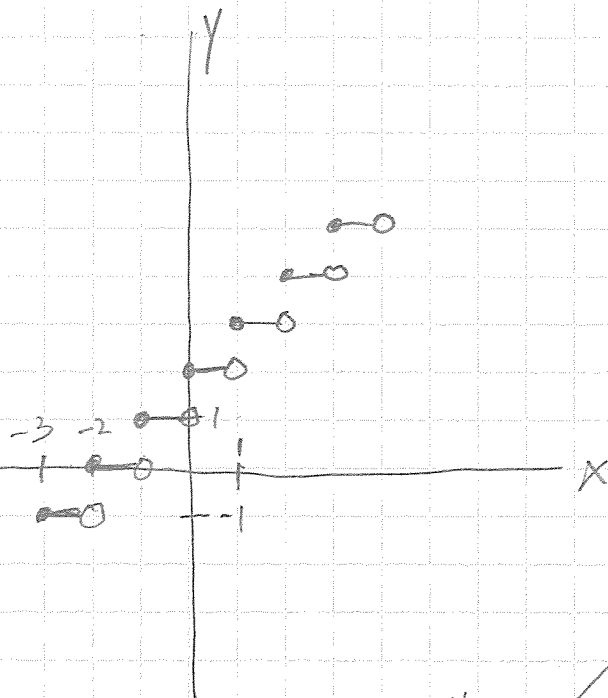
$$y = -0.0196(\quad)^2 + 1.37(\quad)$$

$$y \approx 23.94 \rightarrow \text{About 23.94 miles in height}$$

CR #5 (continued)

⑥

x	[x+2]
-3	-1
$-2\frac{1}{2}$	-1
-2	0
$-1\frac{1}{2}$	0
$-\frac{1}{2}$	1
1	3
$1\frac{1}{2}$	3

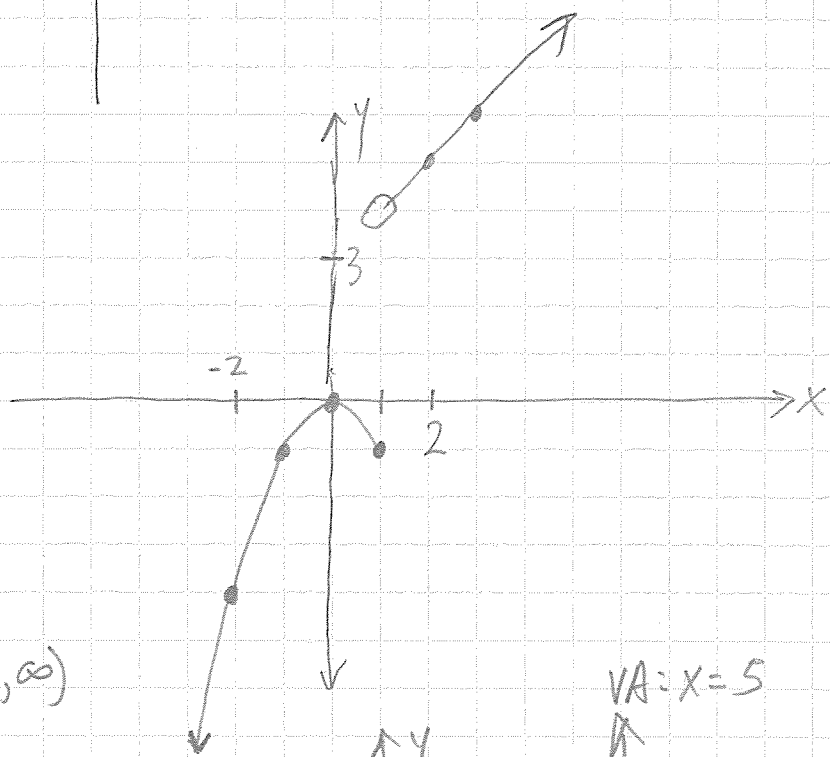


⑦ $f(x) = \begin{cases} x+3, & x > 1 \\ -x^2, & x \leq 1 \end{cases}$

① graph $y = x+3$
for $x > 1$

② graph $y = -x^2$

* Domain: $(-\infty, \infty)$
Range: $(-\infty, 0] \cup (4, \infty)$



⑧ $f(x) = \frac{(x+3)}{(x-5)(x+3)}$

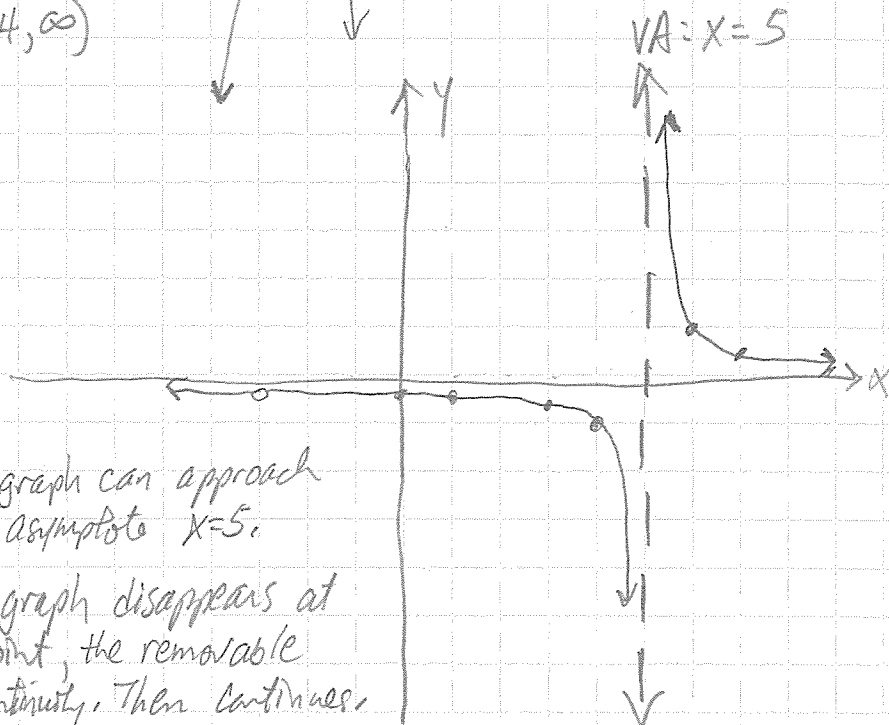
$y = \frac{1}{(x-5)}$

VA: $x = 5$

HA: $y = 0$

RD: $(-3, \frac{1}{8})$

① The graph can approach the asymptote $x=5$.
② The graph disappears at a point, the removable discontinuity, then continues.



CR #5 continued

④ let $x = \#$ liters of 26% ammonia

$$(\text{amt of 1st})(\%) + (\text{amt of 2nd})(\%) \leq (\text{total amt})(\%)$$

$$10(0.06) + (x)(0.26) \leq (x+10)(0.16)$$

$$0.6 + 0.26x \leq 0.16x + 1.6$$

$$0.10x \leq 1$$

$$x \leq 10 \rightarrow$$

At most 10 liters

$$\textcircled{5} \frac{x}{(x-6)(x-3)} - \frac{(x-2)}{(x-6)(x-4)}$$

$$= \frac{x(x-4) - (x-2)(x-3)}{(x-6)(x-3)(x-4)}$$

$$= \frac{x^2 - 4x - (x^2 - 5x + 6)}{(x-6)(x-3)(x-4)}$$

$$= \frac{(x-6)}{(x-6)(x-3)(x-4)} \Rightarrow \boxed{\frac{1}{(x-3)(x-4)}}$$

$$\textcircled{6} \log_3 x(x-2) = 1$$

$$x(x-2) = 3$$

$$x^2 - 2x - 3 = 0$$

$$(x-3)(x+1) = 0$$

$$x=3 \quad x=-1$$

{3}, -1 extraneous

$$\textcircled{11} \log_2 6a - \log_2 5^3$$

$$\log_2 \frac{6a}{5^3}$$

$$\boxed{\log_2 \frac{6a}{125}}$$

$$\textcircled{8} \text{ a) } y = 5x - 6$$

$$x = 5y - 6$$

$$\boxed{\frac{x+6}{5} = y}$$

Yes, this is a function

$$f^{-1}(x) = \frac{x+6}{5}$$

$$\text{b) } y = x^2 + 6x + 9$$

$$x = y^2 + 6y + 9$$

$$x = (y+3)^2$$

$$\pm\sqrt{x} = y+3$$

$$\boxed{y = -3 \pm \sqrt{x}}$$

No, not a function.

$$\textcircled{12} \frac{3^{2(x+6)}(\frac{1}{2})}{3^{3x}(\frac{1}{2})} = 3^5$$

$$x+6 - \frac{3}{2}x = 5$$

$$2x+12 - 3x = 10$$

$$\boxed{2=x}$$

$$\frac{ck}{\sqrt{\frac{9^8}{27^2}}} \stackrel{?}{=} 243$$

$$\sqrt{59049} \stackrel{?}{=} 243 = \sqrt{243^2}$$

$$\textcircled{9} \log_8 (\log_2 x) = 5^{\circ}$$

$$\log_2 x = 8^{\circ}$$

$$x = 2^8 \rightarrow 256$$

2⁸ or 256

CR #5 Continued

$$(13) \frac{4}{\sqrt[3]{3}} \rightarrow \frac{4}{3^{\frac{1}{3}}} \cdot \frac{3^{\frac{2}{3}}}{3^{\frac{2}{3}}} = \boxed{\frac{4\sqrt[3]{9}}{3}}$$

$$(14) \frac{16}{\sqrt[4]{8}} \rightarrow \frac{16}{8^{\frac{1}{4}}} \rightarrow \frac{16}{2^{3(\frac{1}{4})}} \rightarrow \frac{16}{2^{\frac{3}{4}}} \cdot \frac{2^{\frac{1}{4}}}{2^{\frac{1}{4}}} = \frac{16\sqrt[4]{2}}{2} = \boxed{8\sqrt[4]{2}}$$

$$(15) ax^2 + bx + c = 0$$

$$x^2 + \frac{b}{a}x + \frac{c}{a} = 0$$

$$\frac{b}{a} = -(\text{sum of roots})$$

$$\frac{c}{a} = (\text{product of roots})$$

$$= (2+3i)(2-3i)$$

$$\frac{b}{a} = 2+3i + 2-3i$$

$$= 4 + 9$$

$$\frac{b}{a} = 4$$

$$\frac{c}{a} = 13$$

$$\boxed{x^2 - 4x + 13 = 0}$$

(16) See graph paper

$$(17a) 8x^3 - 125$$

$$= 2^3x^3 - 5^3$$

$$= (2x)^3 - (5)^3$$

$$= \boxed{(2x-5)(4x^2+10x+25)}$$

$$b) 64x^3 + 27y^3$$

$$= 4^3x^3 + 3^3y^3$$

$$= (4x)^3 + (3y)^3$$

$$= \boxed{(4x+3y)(16y^2-12xy+9y^2)}$$

CR #5 continued

18) $(2x-3)^6 \rightarrow$

$$\begin{array}{cccccc} & & & & & 1 \\ & & & & & 2 \\ & & & & 1 & 3 & 3 & 1 \\ & & & 1 & 4 & 6 & 4 & 1 \\ & & 1 & 5 & 10 & 10 & 5 & 1 \\ 1 & 6 & 15 & 20 & 15 & 6 & 1 \end{array} \leftarrow \text{Coefficients}$$

$$= 1(2x)^6 + 6(2x)^5(-3)^1 + 15(2x)^4(-3)^2 + 20(2x)^3(-3)^3 + 15(2x)^2(-3)^4 + 6(2x)(-3)^5 + (-3)^6$$

$$= \boxed{64x^6 - 576x^5 + 2160x^4 - 4320x^3 + 4860x^2 - 2916x + 729}$$

19) $P(x) = x^3 + 5x^2 - 2x - 24$

$b=2$

$x-2$ factor \nearrow

$$\begin{array}{r|rrrr} 2 & 1 & 5 & -2 & -24 \\ & & 2 & 14 & 24 \\ \hline & 1 & 7 & 12 & 0 \end{array}$$

$x^2 + 7x + 12$

$(x+3)(x+4)(x-2) = 0$

$x = -3, x = -4, x = 2$

zeros: $\{-3, -4, 2\}$

20) $P(x) = x^3 + 2x^2 - 13x + 10$

$b=2$

$x-2$ \nearrow

$$\begin{array}{r|rrrr} 2 & 1 & 2 & -13 & 10 \\ & & 2 & 8 & -10 \\ \hline & 1 & 4 & -5 & 0 \end{array}$$

$x^2 + 4x - 5$

$(x+5)(x-1)(x-2) = 0$

$x = -5, x = 1, x = 2$

zeros: $\{-5, 1, 2\}$

21) a) $\frac{5y}{1-2y} - \frac{2y}{2y+1} + \frac{3}{(2y+1)(2y-1)} \Rightarrow \frac{-5y}{(2y-1)} - \frac{2y}{(2y+1)} + \frac{3}{(2y+1)(2y-1)} \Rightarrow$

$= \frac{-5y(2y+1) - 2y(2y-1) + 3}{(2y-1)(2y+1)} = \frac{-10y^2 - 5y - 4y^2 + 2y + 3}{(2y-1)(2y+1)} = \boxed{\frac{-14y^2 - 3y + 3}{(2y-1)(2y+1)}}$

b) $\frac{5}{(x+3)} + \frac{4}{(x+3)} - \frac{2}{(x+3)^2} \Rightarrow \frac{5(x+3) + 4(x+3) - 2}{(x+3)^2} = \boxed{\frac{9x+25}{(x+3)^2}}$

22) a) $\frac{\left(\frac{y}{x+y} + \frac{x+y}{y}\right)(xy(x+y))}{\left(\frac{x-y}{x} + \frac{y}{x+y}\right)(xy(x+y))} \Rightarrow \frac{xy^2 + x(x+y)^2}{y(x-y)(x+y) + xy^2} \Rightarrow \boxed{\frac{xy^2 + x^3 + 2x^2y + xy^2}{x^2y + xy^2 - y^3}}$

b) $\frac{\left(\frac{3}{a} + \frac{3}{b} - \frac{6}{ab}\right)(ab)}{\left(\frac{4}{a} + \frac{4}{b} - \frac{8}{ab}\right)(ab)} \Rightarrow \frac{3b+3a-6}{4b+4a-8} \Rightarrow \frac{3(a+b-2)}{4(a+b-2)} = \boxed{\frac{3}{4}}$