Day 1 Review

NCFE Review #1

1) Rational - can be written as a fraction (i.e. $\frac{22}{7}$)
Irrational - can not be written as a fraction (i.e. $\sqrt{2}$)
a) whole number: $2 \rightarrow 6 \cdot 2 = 12$ ✓
b) rational number: $\frac{1}{7} \rightarrow 6 \cdot \frac{1}{7} = 6/7$ ✓
c) irrational number: $\sqrt{2} \rightarrow 6 \cdot \sqrt{2} =$

2) $(x+2i)(y-6i) = 40-10i$ Remember $i^2 = -1$
$xy - 6ix + 2iy - 12i^2$
$xy - 6ix + 2iy + 12 = 40 - 10i$
*Break up
$xy + 12 = 40$
$-12 \quad -12$
$xy = 28$
guess & check
$7 \cdot 4 = 28$ & $2 \cdot 14 = 28$
(use answer choices to help)

$-6ix + 2iy = -10i$
Does $-6i(7) + 2i(4) = -10i$?
$-35i + 14i$
$-21i \neq -10i$
Does $-6i(4) + 2i(7) = -10i$?
$-24i + 14i$
$-10i = -10i$:)

Not done, original question asked $x-y$
so $x=4$ & $y=7 \rightarrow 4-7 = \boxed{-3}$

(To complete without guess & check, use substitution)

3) $(4+5i) - (6-2i)$
$4 + 5i - 6 + 2i = \boxed{-2+7i}$ Keep in a+bi form

4) $x^2 + 4x + 6$ * can't be factored so complete the square or quadratic formula

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{-4 \pm \sqrt{4^2 - 4(1)(6)}}{2(1)}$ (16 - 24)

$\sqrt{-8}$
4 2
2 2

$= \frac{-4 \pm \sqrt{-8}}{2} = \frac{-4 \pm 2i\sqrt{2}}{2} = \boxed{-2 \pm 2i}$

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⑤ $\cancel{5}\left(\frac{x^2}{\cancel{5}}\right) = (5x-17)5$

$x^2 = 25x - 85$

$x^2 - 25x + 85 = 0 \rightarrow x = \frac{-25 \pm \sqrt{(25)^2 - 4(1)(85)}}{2(1)}$

$= \boxed{\frac{-25 \pm \sqrt{285}}{2}}$

$\sqrt{285}$ 15 19 5 3

⑥ $x = 3 + 4i$ (from unit 2)

$-3 \quad -3$

$\frac{x-3}{4} = \frac{4i}{4}$

$\left(\frac{x-3}{4}\right)^2 = (i)^2 \rightarrow \frac{(x-3)^2}{16} = -1$

$\frac{x^2 - 6x + 9}{16} = -1 \rightarrow 1/16\,x^2 - 6/16\,x + 9/16 = -1$

$1 = \frac{16}{16}$

$+\frac{16}{16} \quad +\frac{16}{16}$

$1/16\,x^2 - 6/16\,x + 25/16 = 0$

$\boxed{1/16\,(x^2 - 6x + 25) = 0}$

Review #2

① $x^2 + 4x - 9 = 0$ *complete the square or graph in calculator and find min

$x^2 + 4x \quad = 9$

$\left(\frac{4}{2}\right)^2 = 2^2 = 4$

$x^2 + 4x + 4 = 13 \rightarrow (x+2)^2 = 13$

$(x+2)^2 - 13 = 0$

$h = -2 \quad k = -13$

$-2 + -13 = \boxed{-15}$

② $x^2 - 9x - 15 = (x+h)^2 - 35.25$ * same as #1

$x^2 - 9x + 20.25 = 15 + 20.25$

$\left(\frac{-9}{2}\right)^2 = (-4.5)^2 = 20.25$

$\rightarrow (x - 4.5)^2 = 30.25$

$\boxed{h = 4.5}$

③ $x^3 - 2x^2 - 35x$

$x(x^2 - 2x - 35) = \boxed{x(x-7)(x-5)}$

* ④ $a_1 = 2 \quad r = 1/3 \quad n = 3000$

$S_n = \frac{2(1 - (1/3)^{3000})}{1 - 1/3} = \frac{2(1-0)}{-2/3} = \frac{2}{-\frac{2}{3}} = \frac{2}{1} \cdot \frac{-3}{2} = \boxed{-3}$

⑤ a) $(6x^4 + 5x^3 - 7x + 5) - (6x^4 + 5x)$

$\cancel{6x^4} + 5x^3 - 7x + 5 - \cancel{6x^4} - 5x = \boxed{5x^3 - 12x + 5}$

b) $(x+5)(x+5)(x+5)(x+5)$ pascal's Δ: 1 4 6 4 1

$(x^2 + 10x + 25)(x^2 + 10x + 25)$

$\boxed{x^4 + 20x^3 + 150x^2 + 500x + 625}$

c) $(x^5 + 7x)(-2x^2 + 6x - 1) = \boxed{-2x^7 + 6x^6 - x^5 - 14x^3 + 42x^2 - 7x}$

(6) $m^{2x} + m^x - 6$ $\xrightarrow{\text{pretend it says}}$ $m^2 + m - 6$ Factor

$(m+3)(m-2)$

now add the x's $\longrightarrow$ $\boxed{(m^x+3)(m^x-2)}$ TA DAH!

(7) a) $2^x = 497$ | $10^x = 497$ | $e^x = 497$

$\log_2 497 = x$ | $\log_{10} 497 = x$ | $\ln 497 = x$

$\boxed{2^{8.957} = 497}$ | $\boxed{10^{2.696} = 497}$ | $\boxed{e^{6.209} = 497}$

b) $2^x = 75$ | $10^x = 75$ | $e^x = 75$

$\log_2 75 = x$ | $\log_{10} 75 = x$ | $\ln 75 = x$

$\boxed{2^{6.223} = 75}$ | $\boxed{10^{1.875} = 75}$ | $\boxed{e^{4.317} = 75}$

c) you get an error because you can't take a "log" of a negative number

answer: $\boxed{\text{no real solution}}$

Review # 3

(1) Remainder Theorem is best approach although synthetic division would work as well

(x-2) is a factor so remainder is 0

solution $x = 2$

$(2)^4 - 3(2)^3 + a(2)^2 - 6(2) + 14 = 0$

$16 - 24 + 4a - 12 + 14 = 0$

$4a - 6 = 0 \longrightarrow 4a = 6 \longrightarrow \boxed{a = 3/2}$

(2) $(x-3)^2(x-1)^3(x+3)$

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

pascal's Δ

1 3 3 1

$(x-3)(x^2-9)(x^3-3x^2+3x-1)$

$(x^3-3x^2-9x+27)(x^3-3x^2+3x-1)$

(3)
$$\begin{array}{r|rrrrr} -2 & \overset{4}{1} & \overset{3}{-1} & \overset{2}{8} & \overset{1}{-9} & \overset{0}{30} \\ & \downarrow & -2 & 6 & -28 & 74 \\ \hline & 1 & -3 & 14 & -37 & 104 \end{array}$$

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(4) $(x+8)(x+3)(x-6)$ ← 3 solutions so must be at least a cubic (could be bigger if there are complex solutions)

(5)

	x^3	x^2	x^1	x^0
-4	1	7	13	6
	↓	-4	-12	-4
	1	3	1	2

$$\boxed{x^2+3x+1+\frac{2}{x+4}}$$

(6) $\dfrac{x^2+x-6}{x^2-1}\cdot\dfrac{x-1}{x^2+8x+15} = \dfrac{(\cancel{x+3})(x-2)}{(x+1)(\cancel{x-1})}\cdot\dfrac{(\cancel{x-1})}{(x+5)(\cancel{x+3})}$

$$=\boxed{\frac{x-2}{(x+1)(x+5)}}$$

Review #4

(1) $12 = B$ so... $12 = 1.69\sqrt{s+4.45} - 3.49$

$+3.49 \qquad +3.49$

$15.49 = 1.69\sqrt{s+4.45}$

$\dfrac{15.49}{1.69} = \dfrac{1.69\sqrt{s+4.45}}{1.69}$

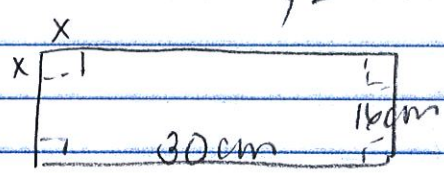
$(9.166)^2 = (\sqrt{s+4.45})^2$

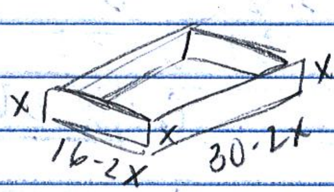
$84.010 = s+4.45 \rightarrow \boxed{s=79.56}$

* could type $y_1 = 12$ &

$y_2 = 1.69\sqrt{s+4.45} - 3.49$, then find intersection

(2)





$V = l \cdot w \cdot h$

$V = (30-2x)(16-2x)(x)$

* graph then find maximum $= (3.33, 725.93)$

x value ↗ ↑ max volume

$h = \boxed{3.33}$

$w = 16-2(3.33) = \boxed{9.34}$

$l = 30-2(3.33) = \boxed{23.34}$

(3) population is always Pe^{rt}

$\dfrac{13.4}{6.7} = \dfrac{6.7e^{.0116t}}{6.7}$

$2 = e^{.0116t} \rightarrow \ln 2 = .0116t$

$.693 = .0116t$

$\boxed{t = 59.7}$

④ $\begin{cases} x^2+y^2=10 \\ 2x+y=1 \end{cases}$ $\longrightarrow$ $C=(0,0)$ $r=\sqrt{10}\approx 3.16$

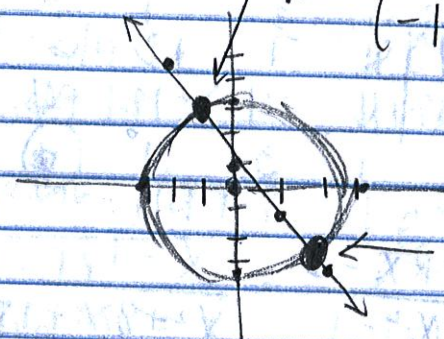
solve for y

$$2x+y=1$$
$$-2x \quad\quad -2x$$
$$y=-2x+1$$

$$x^2+y^2=10$$
$$-x^2 \quad\quad -x^2$$
$$\sqrt{y^2}=\sqrt{-x^2+10}$$
$$y=\pm\sqrt{-x^2+10}$$

$\boxed{2nd}$ $\boxed{5}$ intersect

(-1, 3)



(1.8, -2.6)

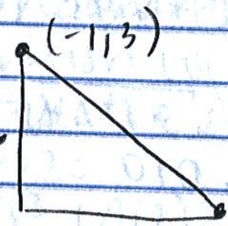
In $\boxed{y=}$ you should have...

$$y_1=-2x+1$$
$$y_2=\sqrt{-x^2+10}$$
$$y_3=-\sqrt{-x^2+10}$$

Distance: $\sqrt{(-1-1.8)^2+(3--2.6)^2}$

$$\sqrt{7.84+31.36}=\boxed{6.26}$$

OR



$$2.8^2+5.6^2=c^2$$
$$39.2=c^2$$
$$c=\boxed{6.26}$$