Spring 2015

HONORS Unit 3 **NO GRAPHING CALC ON FRONT!!** NAME Key

Group Quiz (#1-7: 10 pts each)

$x^7 - x^6 + x^5 + x - 1$ 1a. Find the quotient when $x^8 + x^5 + x^2 - 1$ is divided by $(x+1)$

1b. Is $(x+1)$ a factor of $x^8 + x^5 + x^2 - 1$? Yes/No Yes Explain why/why not: When divided remainder = 0

$x^3 - x^2 + 2x + 4 + \frac{16}{2x-3}$ 2. Divide using **synthetic division** $(2x^4 - 5x^3 + 7x^2 + 2x + 4) \div (2x - 3)$

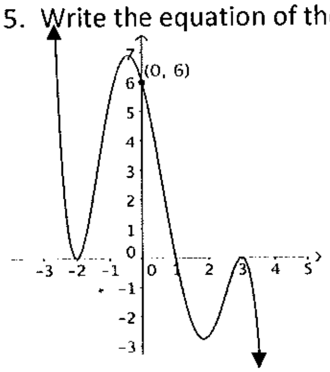
$x^3 + 2x^2 - 5x + 1$ 3. Divide using **long division** $(2x^5 + 7x^4 - 8x^3 - 21x^2 + 23x - 4) \div (2x^2 + 3x - 4)$

4. Find a polynomial in **standard form** of degree 4 such that 3 of its zeros are i, 1, and -2 **and** so that P(0) = -8.

see work on separate sheet

$P(x) = 4x^4 + 4x^3 - 4x^2 + 4x - 8$

5. Write the equation of the graph in **factored form**.



zeros: -2 m2, 1, 3 m2

$P(x) = -\frac{1}{6}(x+2)^2(x-1)(x-3)^2$

$P(x) = a(x+2)^2(x-1)(x-3)^2$

(0,6) $6 = a(0+2)^2(0-1)(0-3)^2$

$6 = a(4)(-1)(9)$

$\frac{6}{-36} = \frac{-36a}{-36}$

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

6. For $f(x) = x^4 - 2x^3 - 21x^2 + 22x + 40$ (see work on separate sheet)

List all possible rational roots (4 pts): ±1, ±2, ±4, ±5, ±8, ±10, ±20, ±40

Find the roots (4 pts): -1, 2, 5, -4

7. Graph: $f(x) = \frac{1}{10}(x-4)(x+3)(x-1)^2$

Must have at least 3 points and the zeros.

zeros: 4, -3, 1 m2

end beh.: L ↑ R ↑ $(\frac{1}{10}x^4)$

y-int: $(0, -\frac{6}{5})$

$\frac{1}{10}(0-4)(0+3)(0-1)^2$

$\frac{1}{10}(-4)(3)(1)$

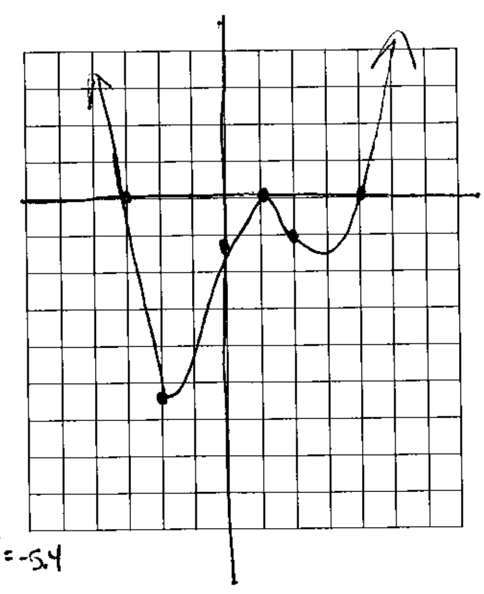
$-\frac{12}{10} = -\frac{6}{5}$

2 more points

x	y
2	-1
-2	-5.4

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

$\frac{1}{10}(-2-4)(-2+3)(-2-1)^2 = \frac{-54}{10} = -5.4$



GRAPHING CALC ALLOWED

8. Expand using Pascal's Triangle: $(2x-3y)^4$ (8 pts)

$$1(2x)^4 + 4(2x)^3(-3y) + 6(2x)^2(-3y)^2 + 4(2x)(-3y)^3 + 1(-3y)^4$$

$$4\cdot 8x^3\cdot(-3y) \qquad 6\cdot 4x^2\cdot 9y^2 \qquad 4\cdot 2x\cdot(-27y^3)$$

8. $16x^4 - 96x^3y + 216x^2y^2 - 216xy^3 + 81y^4$

9. Find the term containing x^4 in the expansion of $(3x^2 + \frac{y}{2})^5$ (6 pts)

$(3x^2)^2$ ← gives a term containing x^4

5 4 3 2 $(3x^2)$

0 1 2 3 $(y/2)$

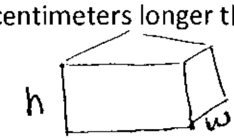
4th term

$$10(3x^2)^2\left(\frac{y}{2}\right)^3 = 10\cdot 9x^4\frac{y^3}{8} = \frac{45}{4}x^4y^3$$

9. $\frac{45}{4}x^4y^3$

(#10 & 11: 8 pts each)

10. The volume of a tin of assorted chocolates is 150 cubic centimeters. The tin is 8 centimeters longer than it is wide and 4 times longer than it is tall. Find the dimensions of the tin. Round to nearest tenth.



Define a variable(s): h = height

ℓ = length

w = width.

$\text{Vol} = \ell\cdot w\cdot h$

Write an equation(s):

$\ell = w+8 \quad 4h = \ell \quad h = \frac{\ell}{4} = \frac{w+8}{4} \quad \text{Vol} = (w+8)\,w\left(\frac{w+8}{4}\right) = 150$

Explain how you got the solution from the equation:

$(w+8)w(w+8) = 600$

$w = 4.1$

$\ell = 4.1 + 8 = 12.1$

$h = 12.1/4 = 3.0$

Graphed this equation in calc. $(w+8)^2w - 600 = 0$ & found the + zero = 4.1

check: $4.1\times 12.1\times 3.0 = 148.83 \approx 150$

State the solution:

Dimensions of tin are $4.1\times 12.1\times 3.0$

11. Find 3 consecutive even numbers such that the difference between the square of the third and twice the square of the first is 32.

Define a variable(s):
x = 1st even #
$x+2$ = next cons. even # (2nd)
$x+4$ = next cons. even # (3rd)

Write an equation(s): $(x+4)^2 - 2(x)^2 = 32$

Explain how you got the solution from the equation:

Graphed in calc. $(x+4)^2 - 2x^2 - 32 = 0$ & found the zero $x=4$

1st # = 4 $\quad x+2 = 6$ 2nd # $\quad x+4 = 8$ 3rd #

State the solution:

The numbers are 4, 6, & 8.

check: $(8)^2 - 2(4)^2 = 64 - 2(16) = 64 - 32 = 32$ ✓

1a.

$$\begin{array}{r|rrrrrrrrr} -1 & \overset{x^8}{1} & 0 & 0 & 1 & 0 & 0 & 1 & 0 & -1 \\ & & -1 & 1 & -1 & 0 & 0 & 0 & -1 & \\ \hline & 1 & -1 & 1 & 0 & 0 & 0 & 1 & -1 & 0 \end{array}$$

$x^7 - x^6 + x^5 + 0x^4 + 0x^3 + 0x^2 + x - 1$

$x^7 - x^6 + x^5 + x - 1$

1b. remainder $= 0$ so yes it is a factor

2. $\frac{1}{2}\left(\frac{2x^4 - 5x^3 + 7x^2 + 2x + 4}{\cancel{2}(x - \frac{3}{2})}\right)$

$$\begin{array}{r|rrrrr} \frac{3}{2} & \overset{x^4}{2} & -5 & 7 & 2 & 4 \\ & & 3 & -3 & 6 & 12 \\ \hline & 2 & -2 & 4 & 8 & 16 \end{array}$$

$\frac{1}{2}\left(2x^3 - 2x^2 + 4x + 8 + \frac{16}{x - 3/2}\right)$

$x^3 - x^2 + 2x + 4 + \frac{16}{2x-3}$

3.

$$\begin{array}{r|l} & x^3 + 2x^2 - 5x + 1 \\ \hline 2x^2 + 3x - 4 & 2x^5 + 7x^4 - 8x^3 - 21x^2 + 23x - 4 \\ & -2x^5 \mp 3x^4 + 4x^3 \\ \hline & \quad 4x^4 - 4x^3 - 21x^2 \\ & \quad -4x^4 \mp 6x^3 + 8x^2 \\ \hline & \qquad -10x^3 - 13x^2 + 23x \\ & \qquad +10x^3 + 15x^2 \mp 20x \\ \hline & \qquad\quad 2x^2 + 3x - 4 \\ & \qquad\quad -2x^2 \mp 3x + 4 \\ \hline & \qquad\qquad 0 \end{array}$$

4. $i, 1, -2$ $\quad P(0) = -8$

$-i$ must also be a zero $\quad (0,-8)$ is a point on graph.

$i, -i$

sum: $0 = {-b}/{a}$

prod: $-i^2 = -(-1) = 1 = \frac{c}{a}$

$a=1 \quad b=0 \quad c=1$

$1, -2$

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

(x^2+x-2)

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

$$\begin{array}{r} x^4+x^3-2x^2 \\ +x^2+x-2 \\ \hline x^4+x^3-x^2+x-2 \end{array}$$

$P(x) = a(x^4+x^3-x^2+x-2)$

$(0,-8)$

$-8 = a(0^4+0^3-0^2+0-2)$

$\frac{-8}{-2} = \frac{a(-2)}{-2}$

$4 = a$

$P(x) = 4(x^4+x^3-x^2+x-2)$

$P(x) = 4x^4+4x^3-4x^2+4x-8$

6.

$$\begin{array}{r|rrrrr} 1 & 1^{x^4} & -2 & -21 & 22 & 40 \\ \hline & \cancel{1} & \cancel{-1} & \cancel{-22} & \cancel{0} & \cancel{40} \end{array}$$

$$\begin{array}{r|rrrrr} -1 & 1^{x^3} & -3 & -18 & 40 & 0 \checkmark \\ \hline \end{array}$$

-1 is a root ✓

now divide w/ this row

$$\begin{array}{r|rrrr} 2 & 1^{x^2} & -1 & -20 & 0 \checkmark \\ \hline \end{array}$$

2 is a root ✓

$x^2 - x - 20$

↳ factors $(x-5)(x+4)$

$x = 5, -4$

roots are: $-1, 2, 5, -4$

8 & 9 Pascal's △

1

1 1

1 2 1

1 3 3 1

#8 use this row → 1 4 6 4 1

1 5 10 10 5 1 ← #9 use this row

4th term.