MATH ANALYSIS I HONORS
REVIEW
Chapter 2

NAME Key
DATE
PERIOD

Scientific Calculators Only!

Find the roots of the following functions by the specified method:

1) grouping method: **$\pm 3, -2$**

a) $x^3 + 2x^2 - 9x - 18 = 0$

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

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

b) $x^3 + 5x^2 + 4x + 20 = 0$ **$\pm 2i, -5$**

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

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

$x^2 = -4 \quad x = -5$

2) quadratic form:

a) $x^4 - 3x^2 - 4 = 0$ **$\pm 2, \pm i$**

$(x^2-4)(x^2+1)$

$x^2 = 4 \quad x^2 = -1$

b) $x^4 + 5x^2 + 6 = 0$ **$\pm i\sqrt{2}, \pm i\sqrt{3}$**

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

$x^2 = -2 \quad x^2 = -3$

3) Rational Root Theorem:

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

possible roots: $1, -1, 3, -3$

$-1 \,|\; 1 \;\; 2 \;\; -2 \;\; -6 \;\; -3 \;\to\; 1 \;\; 1 \;\; -3 \;\; -3 \;\; \underline{0}$

$-1 \,|\; 1 \;\; 1 \;\; -3 \;\; -3 \;\to\; 1 \;\; 0 \;\; -3 \;\; \underline{0}$

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

$\pm\sqrt{3}$, -1 DBL Root

b) $x^3 - 6x^2 + 11x - 6 = 0$

possible roots: $1, -1, 2, -2, 3, -3, 6, -6$

$2 \,|\; 1 \;\; -6 \;\; 11 \;\; -6 \;\to\; 1 \;\; -4 \;\; 3 \;\; \underline{0}$

$x^2 - 4x + 3 = 0$

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

$1, 2, 3$

c) $x^4 + x^3 + x^2 - 9x - 10 = 0$

possible roots: $1, -1, 2, -2, 5, -5, 10, -10$

$-1 \,|\; 1 \;\; 1 \;\; 1 \;\; -9 \;\; -10 \;\to\; 1 \;\; 0 \;\; 1 \;\; -10 \;\; \underline{0}$

$2 \,|\; 1 \;\; 0 \;\; 1 \;\; -10 \;\to\; 1 \;\; 2 \;\; 5 \;\; \underline{0}$

$x^2 + 2x + 5 = 0$ USE QF

$-1, 2, -1 \pm 2i$

4) Find the quadratic equation that has one of its roots $x = 2 + \sqrt{3}$

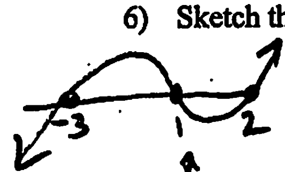
$(2+\sqrt{3})(2-\sqrt{3})$ sum $= 4$, product $= 1$ **$x^2 - 4x + 1$**

5) Find the quadratic equation that has one of its roots $x = 5 - 3i$

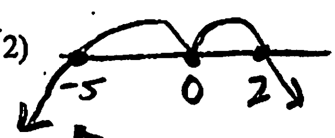
$(5-3i)(5+3i)$ sum $= 10$, product $= 34$ **$x^2 - 10x + 34$**

6) Sketch the graph of each of the following equations. Note what happens at double and triple roots.

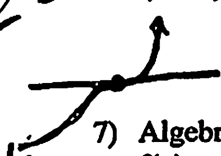
a) $y = (x - 1)(x + 3)(x - 2)$



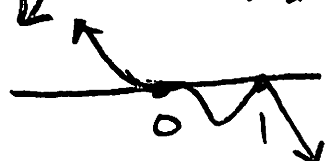
b) $y = -x^2(x + 5)(x - 2)$



c) $y = (x - 1)^3$



d) $y = -x^3(x - 1)^2$



7) Algebraically, find the intersection of the following functions

$f(x) = x^3 - 3x$ and $g(x) = 2$

$x^3 - 3x = 2$

$x^3 - 3x - 2 = 0$ $\pm 1 \pm 2$

$-1 \,|\; 1 \;\; 0 \;\; -3 \;\; -2 \;\to\; 1 \;\; -1 \;\; -2 \;\; \underline{0}$

$x^2 - x - 2 = 0$

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

P.O.I. **$(-1, 2)$, $(2, 2)$**

8) Find the remaining factors and roots for $x^4 - 10x^3 + 35x^2 - 50x + 24$ if two factors are $(x - 1)$ and $(x - 3)$.

$1 \,|\; 1 \;\; -10 \;\; 35 \;\; -50 \;\; 24 \;\to\; 1 \;\; -9 \;\; 26 \;\; -24 \;\; \underline{0}$

$3 \,|\; 1 \;\; -9 \;\; 26 \;\; -24 \;\to\; 1 \;\; -6 \;\; 8 \;\; \underline{0}$

~~There will also be 4 questions worth 2 points each similar to the true and false on p. 89~~

$x^2 - 6x + 8 = 0$

$(x-4)(x-2)$

$x = 4 \quad x = 2$

Math Analysis I Honors

Graphing Calculator Review for Chapter 2 Test 2013

±1 ±2 ±3 ±5 ±6 ±10 ±15 ±30 / ±1 ±2 ±3 ±6

1. List all the possible rational roots of the function . Using a graphing calculator, check to see which ones work. Solve for x. $f(x)= 6x^4 - 11x^3 + 8x^2 - 33x - 30$

$-\frac{2}{3}$ | 6 −15 18 −45 0 (−4 10 −12 30)

$\frac{5}{2}$ | 6 0 18 0 (15 0 45)

$6x^2+18=0$, $6x^2=-18$, $x^2=\frac{-18}{6}$, $x^2=-3$, $x=\pm i\sqrt{3}$

2. Using a graphing calculator, how many real and imaginary roots does the function $f(x) = 5x^3 -7x + 6$ have? Name the real roots(s)

1 Real Root (only 1 x-int) (−1.4858, 0)

2 imaginary roots

need a total of 3 roots

3. List all the possible rational roots of the function - Using a graphing calculator, check to see which ones work. Solve for x. $f(x)= 6x^4 - 11x^3 - 51x^2 + 99x - 27$

±1 ±3 ±9 ±27 / ±1 ±2 ±3 ±6

$x=-3$ $x=3$ $x=\frac{1}{3}$ $x=\frac{3}{2}$

4. Using a graphing calculator, graph the function $G(x) = 0.125x^3 - x^2 + 1.5x + 1$ (Be accurate to 3 decimal) Use coordinate form for points and interval notation for intervals.

Find the :

Zeros: −.494, 2.89, 5.604

Maximum point(s): (.903, 1.631)

Minimum point(s): (4.430, −1.112)

y-intercept: 1

Increasing interval(s): $(-\infty, .903) \cup (4.430, \infty)$

Decreasing interval(s): (.903, 4.430)

End behavior: as $x \to +\infty$, $f(x) \to$ ∞

as $x \to -\infty$, $f(x) \to$ $-\infty$

Answers

1) a. $x = -2, \pm 3$

   b. $x = -5, \pm 2i$

2) a. $x = \pm 2, \pm i$

   b. $x = \pm i\sqrt{3}, \pm i\sqrt{2}$

3) a. $x = -1$ Double root, $x = \pm\sqrt{3}$

   b. $x = 1, 2, 3$

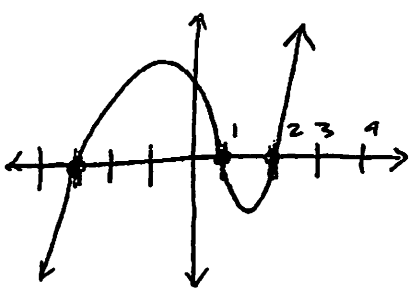
   c. $x = -1, 2 \quad x = -1 \pm 2i$

4) $y = x^2 - 4x + 1$

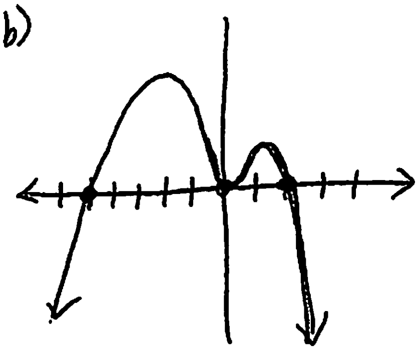
5) $y = x^2 - 10x + 34$

6)

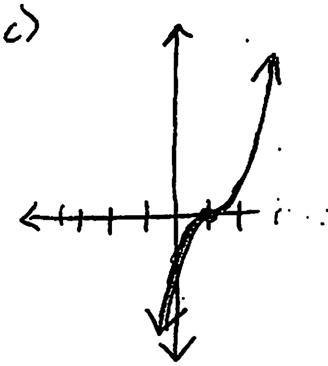
a)



b)



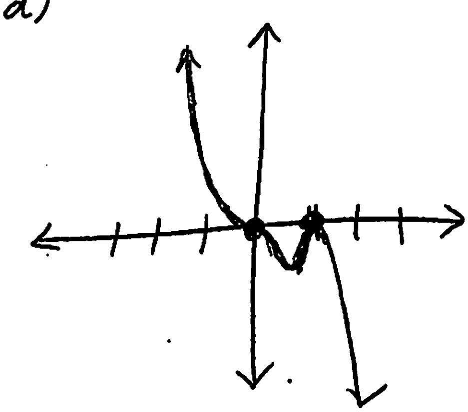
c)



6) (-1, 2) (2, 2)

7) $x = 2, 4$

d)



Answers:

1. 36 Possible roots: ±1, ±2, ±3, ±5, ±6, ±10, ±15, ±30, ±1/2, ±3/2, ±5/2, ±15/2, ±1/3, ±2/3, ±5/3, ±10/3, ±1/6, ±5/6

   In calculator, $x = 5/2$ and $x = -2/3$ are roots.

   After using synthetic division twice, we get $6x^2 + 18 = 0$ so the remaining roots are $x = \pm i\sqrt{3}$

2. 1 real root (-1.486, 0)
   2 imaginary roots

3. 20 possible roots: ±1, ±3, ±9, ±27, ±1/2, ±3/2, ±9/2, ±27/2, ±1/3, ±1/6

   In calculator, x = -3, 3, 3/2, 1/3 are roots.

4. Zeros: (-0.494, 0) (2.890, 0) (5.604, 0)

   Maximum point(s): (0.903, 1.631)

   Minimum point(s): (4.431, -1.113)

   y-intercept: (0, 1)

   Increasing interval(s): $(-\infty, 0.903)$ $(4.431, \infty)$

   Decreasing interval(s): (0.903, 4.431)

   End behavior: as $x \to +\infty$, $f(x) \to +\infty$

   as $x \to -\infty$, $f(x) \to -\infty$