

**Pre Calculus**  
**Chapter 2B Review**

Name: KEY  
Block: \_\_\_\_\_

**No Calculator. Show all applicable work for full credit.**

For 1-3, simplify each expression. Write answers in  $a + bi$  form.

1.  $\sqrt{-36}$

$6i$

2.  $(3+4i)-(2-6i)$

$3+4i-2+6i$

$1+10i$

3.  $\frac{(4+2i)(5+i)}{(5-i)(5+i)} = \frac{20+4i+10i+2i^2}{25+5i-5i-i^2}$   
 $= \frac{20+14i-2}{25+1}$

$= \frac{18+14i}{26} = \frac{9}{13} + \frac{7}{13}i$

In question 4-5, solve.

4.  $x^2 - 6x + 10 = 0$

$x = \frac{6 \pm \sqrt{36 - 4(1)(10)}}{2(1)} = \frac{6 \pm \sqrt{-4}}{2}$   
 $= \frac{6 \pm 2i}{2} = 3 \pm i$

5.  $4x^2 = 8x - 5$

$4x^2 - 8x + 5 = 0$

$x = \frac{8 \pm \sqrt{64 - 4(4)(5)}}{2(4)} = \frac{8 \pm \sqrt{-16}}{8} = \frac{8 \pm 4i}{8}$

$= 1 \pm \frac{1}{2}i$

Write the polynomial, in standard form, whose zeros include those listed below.

6. -3 (multiplicity 2) and 5

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

$(x^2+6x+9)(x-5)$

$x^3 - 5x^2 + 6x^2 - 30x + 9x - 45$

$x^3 + x^2 - 21x - 45$

7. 2 and  $1+2i$

$(x-2)[x-(1+2i)][x-(1-2i)]$

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

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

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

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

$x^3 - 2x^2 + 5x - 2x^2 + 4x - 10 = x^3 - 4x^2 + 9x - 10$

8. Using the given zero, find all the zeros and write the function as the product of linear and irreducible quadratic factors.

$1-3i$  is a zero of  $2x^4 - 15x^3 + 36x^2 - 98x - 60$ ;  $1+3i$  is also a zero

$(1-3i)(-13-6i) = -13-6i+39i+18i^2 = -31+33i$

$(1-3i)(5+33i) = 5+33i-15i-99i^2 = 104+18i$

$(1-3i)(6+18i) = 6+18i-18i-54i^2 = 60$

$1-3i \mid 2 \quad -15 \quad 36 \quad -98 \quad -60$

$2-6i \quad -31+33i \quad 104+18i \quad 60$

$1+3i \mid 2 \quad -13-6i \quad 5+33i \quad 6+18i \quad 0$

$2+6i \quad -11-33i \quad -6-18i$

$2 \quad -11 \quad -6 \quad 0$

$2x^2 - 11x - 6 = 0$

$(2x+1)(x-6) = 0$

$2x+1=0 \quad x-6=0$

$x = -\frac{1}{2} \quad x = 6$

$[x-(1-3i)][x-(1+3i)]$   
 $= (x-1+3i)(x-1-3i)$

$= x^2 - 2x + 1 + 9 = x^2 - 2x + 10$

ZEROS

$x = 1-3i$   
 $x = 1+3i$   
 $x = -\frac{1}{2}$   
 $x = 6$

FACTORS (Linear & Irreducible Quadratic)

$(2x+1)(x-6)(x^2-2x+10)$

For questions 9-11, determine (if it exists):

- a) end behavior including HA or Slant Asymp.
- b) vertical asymptotes
- c) x-intercept(s)

- d) y-intercept
- e) graph (with enough points to be accurate)

9.  $y = \frac{2x+3}{x-1}$

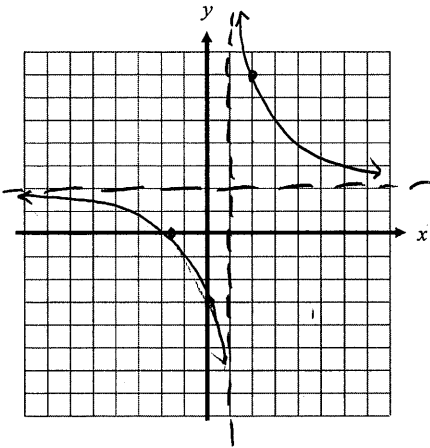
a) HA:  $y = 2$

b) VA:  $x = 1$

c) x-int:  $(-3/2, 0)$   
 $0 = 2x + 3$   
 $-3/2 = x$

d) y-int:  $(0, -3)$

$\frac{x/y}{2/7} = \frac{4/3}{2/1} = 7$



10.  $y = \frac{x^2 - 2x - 8}{x - 4} = \frac{(x-4)(x+2)}{x-4} = x+2$

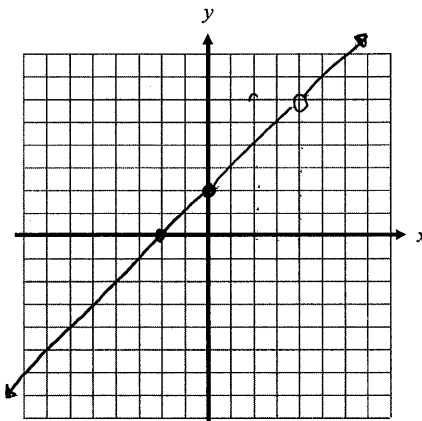
a) NO HA

b) NO VA. HOLE @  $x = 4$   
 $\downarrow$   
 $(4, 6)$

c) x-int:  $(-2, 0)$

$0 = x + 2$   
 $-2 = x$

d) y-int:  $(0, 2)$



11.  $y = \frac{4x^2 + 2x}{x^2 - 2x - 15} = \frac{2x(x+1)}{(x-5)(x+3)}$

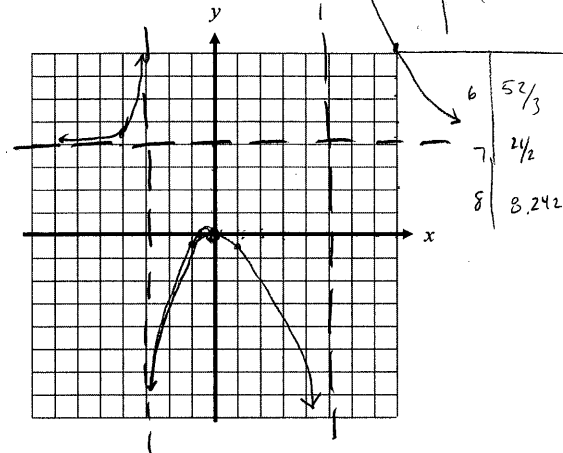
a) HA:  $y = 4$

b) VA:  $x = 5$  and  $x = -3$

c) x-int:  $(0, 0)$  and  $(-1/2, 0)$

d) y-int:  $(0, 0)$

x	y
-4	$\frac{50}{9} \frac{(-8)(-1)}{(-9)(-1)}$
-1	$\frac{-1}{9} \frac{(-2)(-1)}{(-6)(2)}$



12. Identify the x values that cause the function to be zero, positive, negative and undefined.

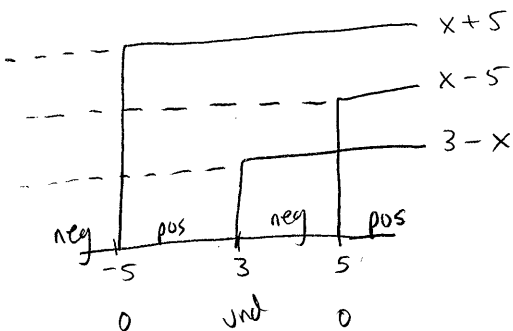
$f(x) = \frac{x^2 - 25}{3 - x} = \frac{(x+5)(x-5)}{3-x}$

$f(x) = 0$  at  $x = -5$  and  $x = 5$

$f(x) > 0$  on  $(-5, 3) \cup (5, \infty)$

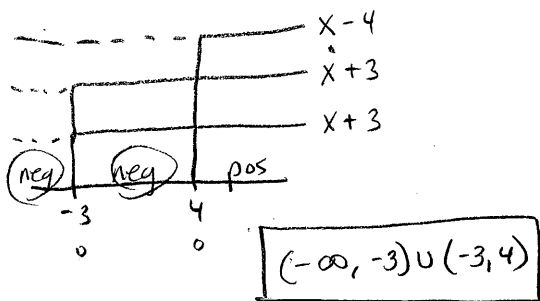
$f(x) < 0$  on  $(-\infty, -5) \cup (3, 5)$

$f(x)$  is undefined at  $x = 3$

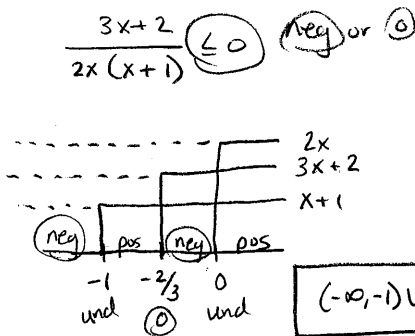


Solve the inequality using a sign chart.

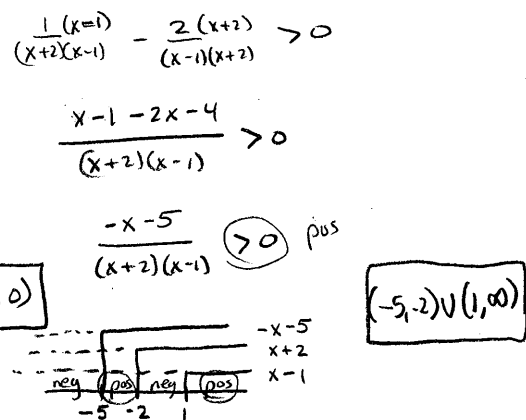
13.  $(x-4)(x+3)^2 < 0$  neg



14.  $\frac{3x+2}{2x^2+2x} \leq 0$



15.  $\frac{1}{x+2} - \frac{2}{x-1} > 0$



Calculator Allowed. Show all applicable work for full credit.

16. Find and verify all the zeros and write the function as the product of linear and irreducible quadratic factors.

a)  $f(x) = x^4 - 8x^3 + 33x^2 - 68x + 52$

Graph  $f(x)$  ...  $x = 2$  looks like a zero w/ multiplicity 2

$$\begin{array}{r|rrrrrr} 2 & 1 & -8 & 33 & -68 & 52 \\ & & 2 & -12 & 42 & -52 \\ \hline 2 & 1 & -6 & 21 & -26 & 0 \\ & & 2 & -8 & 26 & \\ \hline 1 & 1 & -4 & 13 & 0 & \end{array}$$

$$x^2 - 4x + 13 = 0$$

$$x^2 - 4x + 4 = -13 + 4$$

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

$$x-2 = \pm 3i$$

$$x = 2 \pm 3i$$

ZEROS

$$x = 2 \text{ mult} = 2$$

$$x = 2 + 3i$$

$$x = 2 - 3i$$

FACTORS (Linear & Irreducible Quadratic Factors)

$$f(x) = (x-2)^2 (x^2 - 4x + 13)$$

b)  $f(x) = 6x^4 - 7x^3 - x^2 + 67x - 105$

graph  $f(x)$  ...  $x = 3/2$

$$\begin{array}{r|rrrrrr} 3/2 & 6 & -7 & -1 & 67 & -105 \\ & & 9 & 3 & 3 & 105 \\ \hline -7/3 & 6 & 2 & 2 & 70 & 0 \\ & & -14 & 28 & -70 & \\ \hline 6 & -12 & 30 & 0 & \end{array}$$

$$6x^2 - 12x + 30 = 0$$

$$6(x^2 - 2x + 5) = 0$$

$$x^2 - 2x + 5 = 0$$

$$x = \frac{2 \pm \sqrt{4 - 4(1)(5)}}{2(1)} = \frac{2 \pm \sqrt{-16}}{2} = \frac{2 \pm 4i}{2} = 1 \pm 2i$$

ZEROS

$$x = 3/2$$

$$x = -7/3$$

$$x = 1 + 2i$$

$$x = 1 - 2i$$

FACTORS

$$f(x) = (x - 3/2)(x + 7/3)(6x^2 - 12x + 30)$$

17. Solve graphically:  $2x^3 - 5x^2 + 3x \leq 0$