Precalculus
Chapter 2.5 – 2.9 Review

Name: KEY
Block: ____

NO CALCULATOR

For questions 1 – 3, find the following:

a) **All asymptotes (horizontal, vertical, and slant), if they exist.**
b) **All intercepts (x and y), if they exist.**
c) **Holes, if they exist.**
d) **The graph of each function … plot at least 3 points per region.**

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

x-int: $0 = \dfrac{2x+3}{x-1}$ $\quad x = -3/2 \quad \left(-\frac{3}{2}, 0\right)$

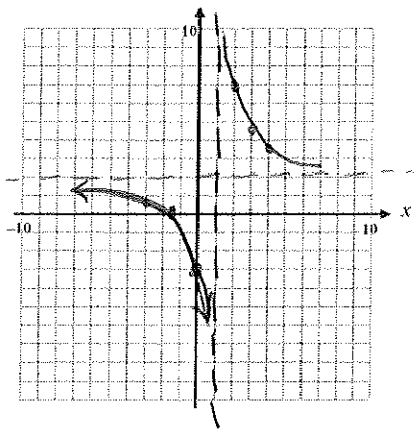
y-int: $y = \dfrac{2(0)+3}{0-1} = -3 \quad (0,-3)$

VA $x = 1$

HA $y = 2$

x	y
-3	$\frac{3}{4}$

$\frac{-6+3}{-3-1} = \frac{-3}{-4} = \frac{3}{4}$



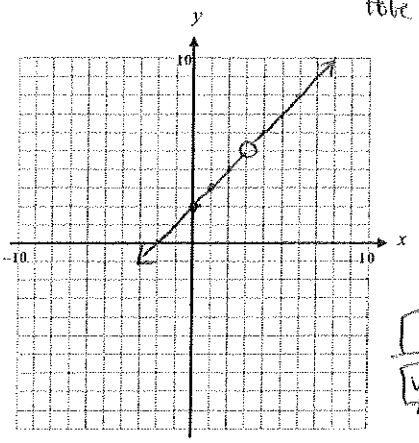
x	y
2	-7
3	4.5
4	$\frac{11}{3} = 3\frac{2}{3}$

2. $y = \dfrac{x^2-2x-8}{x-4} = \dfrac{(x-4)(x+2)}{x-4} = x+2$ A LINE!

Hole when $x = 4$

Hole $(4, 2)$

Just plug $x = 4$ into $y = x+2$



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

y-int: $(0, 2)$

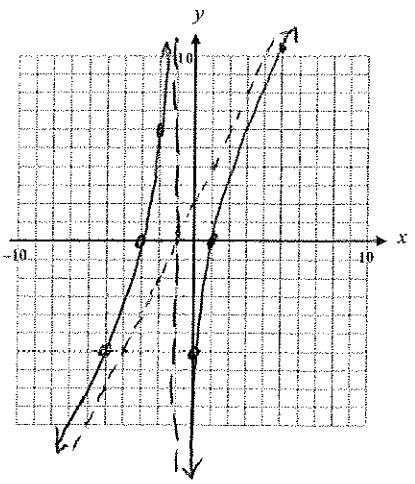
3. $y = \dfrac{2x^2+4x-6}{x+1} = \dfrac{2(x^2+2x-3)}{x+1} = \dfrac{2(x+3)(x-1)}{x+1}$

x	y
-2	6

$\frac{2(-1)(3)}{-1}$

x	y
-5	-6

$\frac{2(-2)(-6)}{-4}$



VA $x = -1$

HA NONE … SLANT!

x-int: $(-3, 0)$ $(1, 0)$

y-int: $(0, -6)$

x	y
5	$10\frac{4}{7}$

$\frac{2(6)(4)}{6} =$

$$x+1 \overline{)\,2x^2+4x-6}$$

$2x+2$

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

$2x-6$

$-(2x+2)$

-8

SLANT Asymptote: $y = 2x+2$

4. Solve the following equation: $x^2 - 6x + 13 = 0$

$$x = \frac{6 \pm \sqrt{36-4(1)(13)}}{2(1)} = \frac{6 \pm \sqrt{36-52}}{2}$$

$$= \frac{6 \pm \sqrt{-16}}{2} = \frac{6 \pm 4i}{2}$$

$$= 3 \pm 2i$$

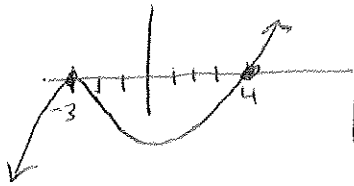
Algebraically solve each inequality. (SIGN CHARTS!)

5. $(x-4)(x+3)^2 \leq 0$

use a graph... zeros = 4 & -3

-3 has multiplicity 2

end behavior model ($+x^3$) ↗



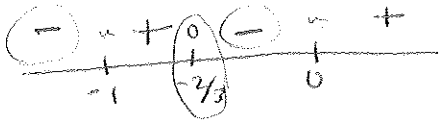
$(-\infty, -3) \cup (-3, 4)$

6. $\dfrac{3x+2}{(x+1)(2x)} \leq 0$

zeros: $x = -2/3$

undefined: $x = -1, x = 0$

$(-\infty, -1) \cup [-2/3, 0)$



7. $\dfrac{1}{x+2} - \dfrac{2}{x-1} > 0$

$\dfrac{1}{(x+2)}\dfrac{(x-1)}{(x-1)} - \dfrac{2}{(x-1)}\dfrac{(x+2)}{(x+2)} > 0$

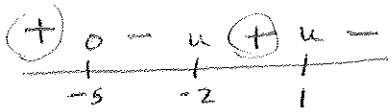
$\dfrac{x-1-2x-4}{(x+2)(x-1)} > 0$

$\dfrac{-x-5}{(x+2)(x-1)} > 0$

$-x-5=0$ | undefined when $x=-2, x=1$

$-5=x$

↑ Don't forget to distribute the -2 to the (x+2)...



$(-\infty, -5) \cup (-2, 1)$

8. [Chapter P Review] Simplify: $\dfrac{m^3(3a)^{-4}}{m^{-7}a^{-3}} = \dfrac{m^3 \cdot m^7 a^3}{81a^4} = \dfrac{m^{10}}{81a}$

9. [Chapter P Review] Solve the following equation: $4|2x-3|-9>15$

$4|2x-3| > 24$

$|2x-3| > 6$

$2x-3 > 6$ OR $2x-3 < -6$

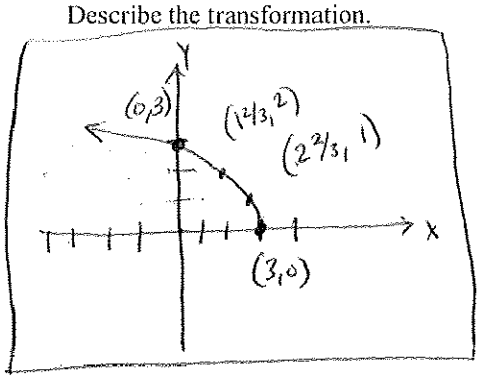
$2x > 9$ $\quad$ $2x < -3$

$x > 9/2$ or $x < -3/2$

$(-\infty, -3/2) \cup (9/2, \infty)$

10. [Chapter 1 Review] Graph the following equation. Identify at least 3 points on the graph. $y = -\sqrt{3x-9}$

Describe the transformation.



$y = -\sqrt{3(x-3)}$

Don't forget to factor out this 3!

Reflection over X-axis

Horizontal shrink by a factor of 1/3

Right 3

original

$(x,y) \rightarrow \left(\frac{x}{3} + 3, -y\right)$

CALCULATOR ALLOWED

11. Given: $g(x) = x^4 - 2x^3 + 13x^2 - 32x - 48$.

(a) Use graphing, synthetic division and the quadratic formula to find all zeros.

ANSWER THE QUESTION ASKED!

2 zeros $x = -1$ and $x = 3$

-1	1	-2	13	-32	-48
		-1	3	-16	48
	1	-3	16	-48	0
3		3	0	48	
	1	0	16	0	

$x^2 + 16 = 0$

$x^2 = -16$

$\sqrt{x^2} = \sqrt{-16}$

$x = \pm 4i$

Don't forget this!

zeros: $x = -1, x = 3, x = 4i, x = -4i$

(b) Write the factorization of $g(x)$ as a product of linear factors and irreducible quadratic factors.

$g(x) = (x+1)(x-3)(x^2+16)$

12. Write an equation for the quadratic function with a vertex of (–3, 4) and containing point (–5, –8)

$y = a(x+3)^2 + 4$

$-8 = a(-5+3)^2 + 4$

$-8 = a(4) + 4$

$-8 = 4a + 4$

$-12 = 4a$

$-3 = a$

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

13. Find a polynomial of degree 3 with roots –4, and $5 - i$. Express the answer in standard form.

if $5-i$ is a zero, $5+i$ is a zero

$y = (x+4)(x-(5-i))(x-(5+i))$

$y = (x+4)(x-5+i)(x-5-i)$

$y = (x+4)[(x-5)^2 + 1]$

$y = (x+4)[x^2 - 10x + 25 + 1]$

$y = (x+4)(x^2 - 10x + 26)$

$y = x^3 - 10x^2 + 26x + 4x^2 - 40x + 104$

$y = x^3 - 6x^2 - 14x + 104$

14. Perform the indicated operation.

(a) $(3 - 4i) - (-8 + 2i)$

$3 - 4i + 8 - 2i$

$11 - 6i$

(b) $\dfrac{3+i}{2-3i}$ (express the answer in $a + bi$ form)

$\dfrac{(3+i)(2+3i)}{(2-3i)(2+3i)} = \dfrac{6 + 9i + 2i + 3i^2}{4+9} = \dfrac{3 + 11i}{13}$ "-3"

$= \dfrac{3}{13} + \dfrac{11}{13}i$

15. [Review Chapter 2a] Find the cubic regression equation (without rounding ANYTHING) for the following data. Let $x = 0$ be the year 1970. Use your equation to predict the number of employees in the year 2004.

$x = 34$

Year	~~1972~~ 2	~~1975~~ 5	~~1978~~ 8	~~1980~~ 10	~~1983~~ 13	~~1986~~ 16
Number of Employees	247	475	658	546	493	605

NO ROUNDING!

$y = +.834001187 3x^3 - 25.87126589x^2 + 248.1148133x - 167.6765039$

$Y(34) = 11140.62645$

$\approx 11,141$ employees

NO OTHER ANSWER ACCEPTED!

Paste CubicReg into Y_1

Run CubicReg... Go to $Y_1 =$

press VARS, 5, EQ, RegEQ ... then QUIT.., press VARS, Y-vars, Y_1, (34)