Precalculus
Test Review 2.5-2.7

Name Key
Period_____ Date_____

1. How many times is $x=4$ a root of $t(x)=x^6-17x^5+100x^4-160x^3-640x^2+2816x-3072$

Run x=4 through a synthetic chart until the remainder isn't zero.

(work is at the end of answer key) 5 times

2. How many times is $x=-3$ a solution to $x^7+x^6-21x^5-5x^4+160x^3-72x^2-432x+432$?

3 times

3. Given the following synthetic chart. What conclusion(s) can be drawn?

-2	3	-1	-11	6
		-6	14	0
	3	-7	3	0
	(+)	(−)	(+)	(−)

lower bound

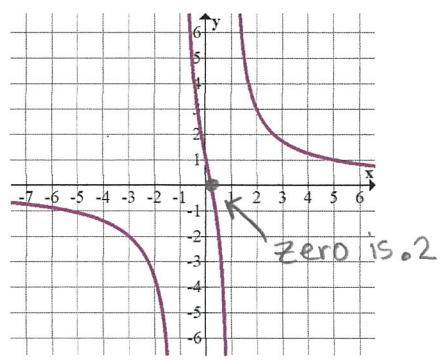
a) $x=-2$ is a zero (remainder zero)
b) $x=-2$ is an upper bound (All positive)
c) $x=-2$ is a lower bound (Alternate signs)
d) $x=-2$ is a factor (x+2) would be the factor
e) No conclusion can be formed

4. The graph of f appears as follows. What is the solution to $f(x)>0$? above x-axis

a) $(-1,\infty)$
b) $[-1,\infty)$
c) $(-1,1)\cup(1,\infty)$
d) $(-1,\ .2)\cup(1,\infty)$
e) none of these

asymptotes @ x=-1 and x=1

$f(x)$

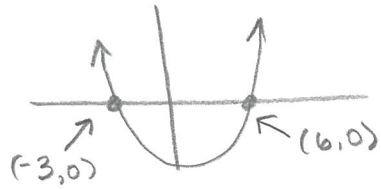


Using graphing calculator

5. Solve. above x-axis
$x^2-3x-18>0$

$(x-6)(x+3)=0$
$x=6 \quad x=-3$

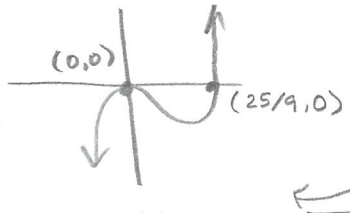
$(-\infty,-3)\cup(6,\infty)$



6. Solve. below x-axis and equal to
$9x^3-25x^2\le 0$

$x^2(9x-25)=0$
$x=0 \quad x=25/9$

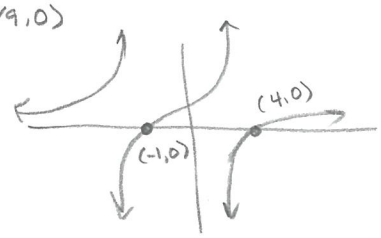
$(-\infty,25/9]$



7. Solve.
$$\frac{x}{x+2}+\frac{-2}{x-1}<0$$

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

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



$(-2,-1)\cup(1,4)$

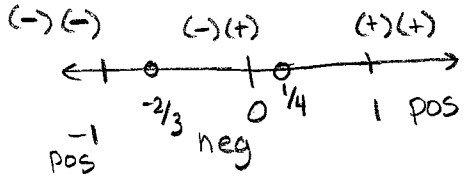
8. Solve. Show work including a sign chart. Give your answers as intervals.

$12x^2 + 5x < 2$

$12x^2 + 5x - 2 = 0$

$(4x - 1)(3x + 2) = 0$

$x = 1/4 \quad x = -2/3$

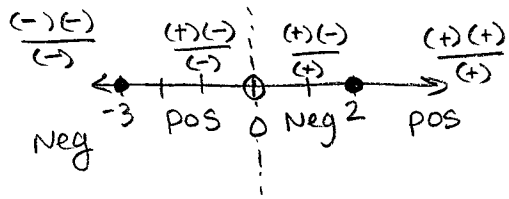


$(-2/3, 1/4)$

9. Solve. Show work including a sign chart. Give your answers as intervals.

$\dfrac{x^2 + x - 6}{x} \geq 0$

$\dfrac{(x+3)(x-2)}{x} = 0$

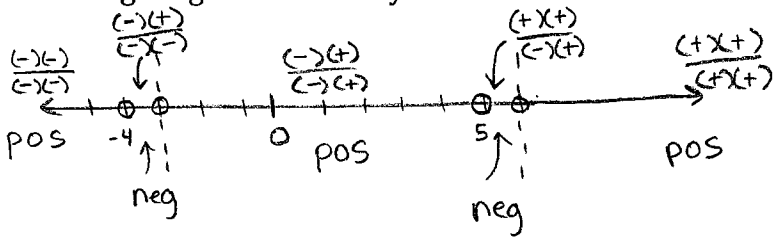


$[-3, 0) \cup [2, \infty)$

10. Solve. Show work including a sign chart. Give your answers as intervals.

$\dfrac{x^2 - x - 20}{x^2 - 3x - 18} < 0$

$\dfrac{(x-5)(x+4)}{(x-6)(x+3)} = 0$



$(-4, -3) \cup (5, 6)$

11. Write the polynomial as the product of linear factors and list all the zeros of the function.

$f(x) = x^6 - x^5 - 15x^4 + 13x^3 + 66x^2 - 40x - 80$

Zeros from calculator

$x = -1, 2$

$x = \pm 2\sqrt{2}$

$x = \pm\sqrt{5}$

$f(x) = (x+1)(x-2)(x-2\sqrt{2})(x+2\sqrt{2})(x-\sqrt{5})(x+\sqrt{5})$

−1	1	−1	−15	13	66	−40	−80
	↓	−1	2	13	−26	−40	80
2	1	−2	−13	26	40	−80	0
	↓	2	0	−26	0	80	
	1	0	−13	0	40	0	

$x^4 - 13x^2 + 40 = 0$

$(x^2 - 8)(x^2 - 5) = 0$

$x = \pm\sqrt{8} \quad x = \pm\sqrt{5}$

12. Write the polynomial as the product of linear factors and list all the zeros of the function.

$f(x) = 2x^4 + 5x^3 + 4x^2 + 5x + 2$

Zeros from calculator

$x = -2$

$x = -1/2$

$x = \pm i$

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

−2	2	5	4	5	2
	↓	−4	−2	−4	−2
	2	1	2	1	0

$\underbrace{2x^3 + x^2}\underbrace{+ 2x + 1} = 0$ factor by grouping

$x^2(2x+1) + (2x+1) = 0$

$(2x+1)(x^2+1) = 0$

$x = -1/2 \quad x = \pm i$

13. Write the polynomial as the product of linear factors and list all the zeros of the function.

$f(x) = x^4 - 4x^3 + 8x^2 - 16x + 16$

Zeros from calculator

$x = 2$ multiplicity 2

$x = \pm 2i$

$$\begin{array}{r|rrrrr} 2 & 1 & -4 & 8 & -16 & 16 \\ & \downarrow & 2 & -4 & 8 & -16 \\ \hline 2 & 1 & -2 & 4 & -8 & 0 \\ & \downarrow & 2 & 0 & 8 & \\ \hline & 1 & 0 & 4 & 0 & \end{array}$$

$x^2 + 4 = 0$

$x = \pm 2i$

$f(x) = (x-2)^2(x-2i)(x+2i)$

14. Write the polynomial given the following zeros.

Zeros: $2 + i$ and -5 $\quad 2-i \leftarrow$ zero also

$f(x) = (x+5)(x-2-i)(x-2+i)$

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

$-2x \quad +4 - 2i$

$-xi + 1 \quad +2i)$

$f(x) = (x+5)(x^2 - 4x + 5)$

$f(x) = x^3 - 4x^2 + 5x$

$5x^2 - 20x + 25$

$f(x) = x^3 + x^2 - 15x + 25$

15. Write the polynomial given the following zeros.

Zeros: -6 and -2 (multiplicity 2)

$f(x) = (x+6)(x+2)(x+2)$

$f(x) = (x+6)(x^2 + 4x + 4)$

$f(x) = x^3 + 4x^2 + 4x$

$6x^2 + 24x + 24$

$f(x) = x^3 + 10x^2 + 28x + 24$

16. $f(x) = \dfrac{x^2 - 2x + 3}{x + 2}$

x-intercept

$x^2 - 2x + 3 = 0 \qquad x = \dfrac{2 \pm \sqrt{4 - 4(1)(3)}}{2(1)}$ imaginary

Hole: None

Vertical asymptote: $x = -2$

Horizontal asymptote: None

End behavior asymptote: $y = x - 4$

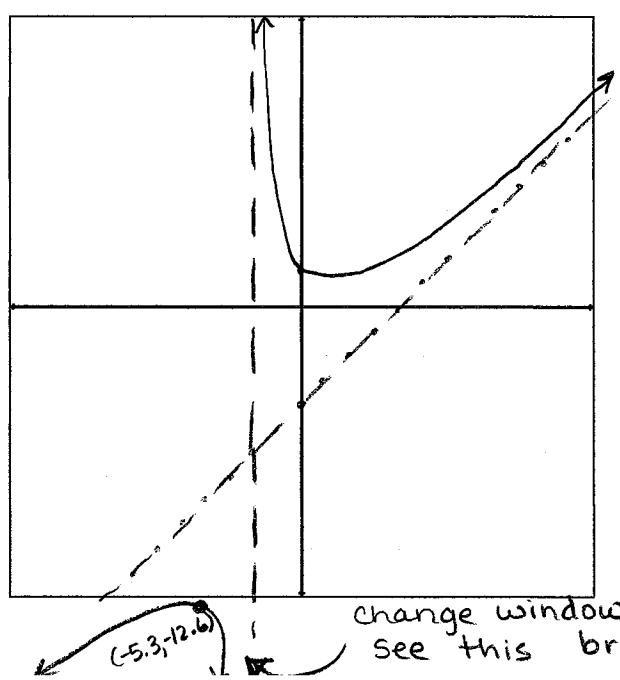
x – Intercept: None

y – Intercept: $(0, 3/2)$

Domain: $\mathbb{R}$ $x \neq -2$

End behavior asymptote

$$\begin{array}{r|rrr} -2 & 1 & -2 & 3 \\ & \downarrow & -2 & 8 \\ \hline & 1 & -4 & 11 \end{array}$$



change window to see this branch

17. $f(x) = \frac{3x^2-2x+4}{x^2-4x-5}$

$(x-5)(x+1)$

Hole: None

Vertical asymptote: $x=5,-1$

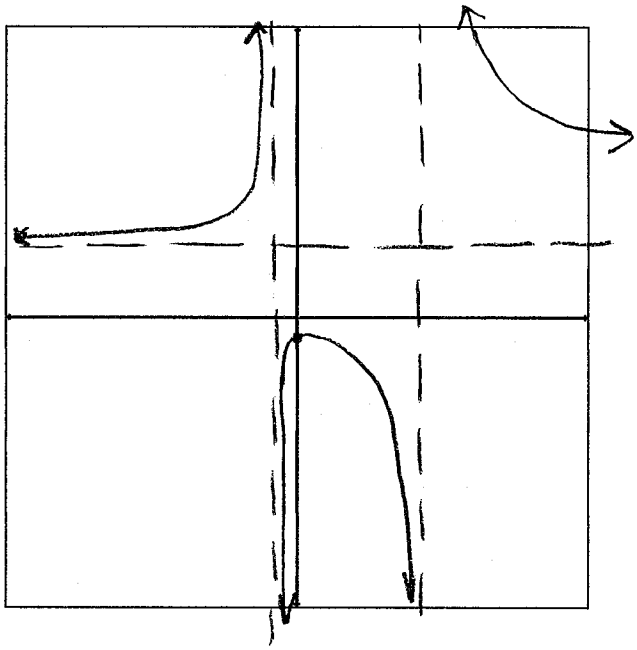
Horizontal asymptote: $y=3$

End behavior asymptote: None

x – Intercept: None

y – Intercept: $(0,-4/5)$

Domain: $\mathbb{R}$ $x \neq 5,-1$



18. $f(x) = \frac{x^2+x-2}{x^2-9}$ $\frac{(x-2)(x+1)}{(x+3)(x-3)}$

Hole: None

Vertical asymptote: $x=-3,3$

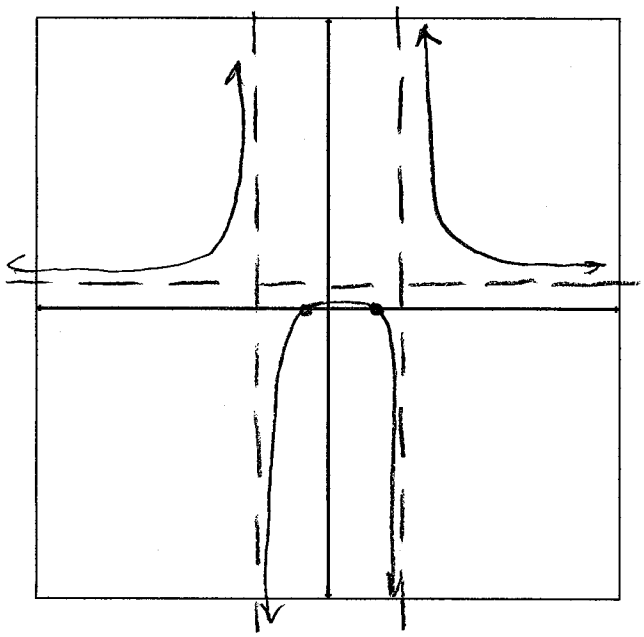
Horizontal asymptote: $y=1$

End behavior asymptote: None

x – Intercept: $(2,0)(-1,0)$

y – Intercept: $(0,2/9)$

Domain: $\mathbb{R}$ $x \neq -3,3$



19. $f(x) = \frac{3x-3}{x^2-1}$ $\frac{3\cancel{(x-1)}}{(x+1)\cancel{(x-1)}}$

Hole: $(1, 3/2)$

Vertical asymptote: $x = -1$

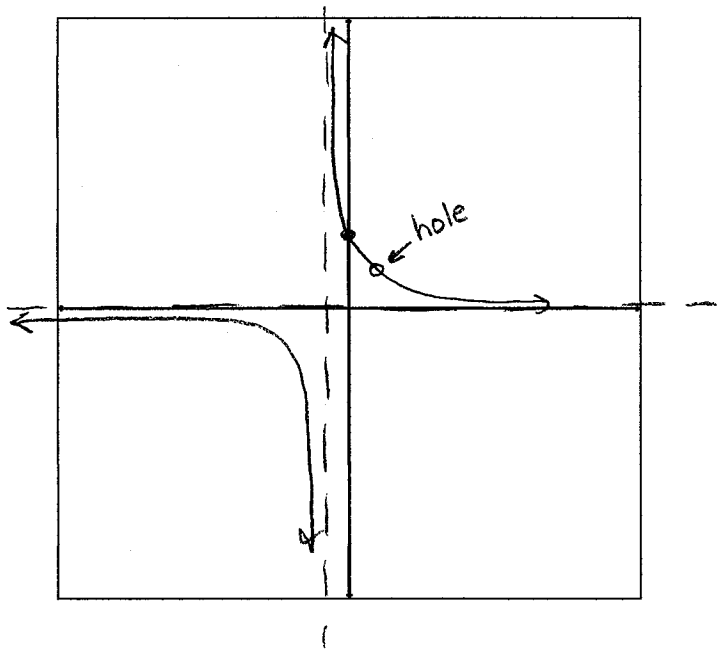
Horizontal asymptote: $y = 0$

End behavior asymptote: None

x – Intercept: None

y – Intercept: $(0,3)$

Domain: $\mathbb{R}$ $x \neq 1, -1$



20. $f(x) = \frac{6-3x}{x^2-5x+6}$ $\frac{-3\cancel{(x-2)}}{\cancel{(x-2)}(x-3)}$

Hole: $(2, 3)$

Vertical asymptote: $x = 3$

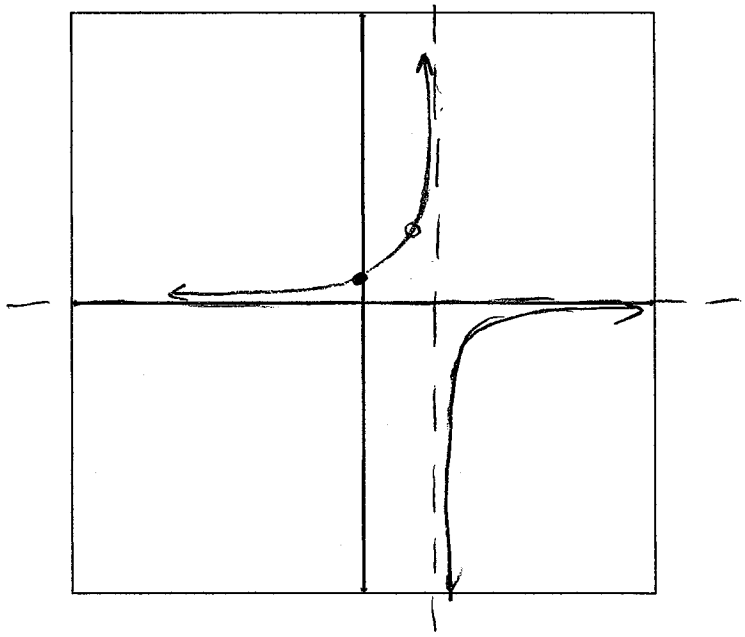
Horizontal asymptote: $y = 0$

End behavior asymptote: None

x – Intercept: None

y – Intercept: $(0,1)$

Domain: $\mathbb{R}$ $x \neq 2, 3$



21. Find the end behavior asymptote

a) $h(x) = \frac{2x^3+x^2-23x-2}{2x-5}$

$$
\begin{array}{r}
x^2+3x-4 \\
2x-5 \overline{\big) 2x^3+x^2-23x-2} \\
-2x^3+5x^2 \\
\hline
6x^2-23x \\
-6x^2+15x \\
\hline
-8x-2 \\
+8x+20 \\
\hline
-22
\end{array}
$$

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

b) $f(x) = \frac{x^4-2x+1}{x-2}$

$$
\begin{array}{r|rrrrr}
2 & 1 & 0 & 0 & -2 & 1 \\
 & \downarrow & 2 & 4 & 8 & 12 \\
\hline
 & 1 & 2 & 4 & 6 & 13
\end{array}
$$

$y = x^3+2x^2+4x+6$

#1

4	1	-17	100	-160	-640	2816	-3072
	↓	4	-52	192	128	-2048	3072
4	1	-13	48	32	-512	768	0
	↓	4	-36	48	320	-768	
4	1	-9	12	80	-192	0	
	↓	4	-20	-32	192		
4	1	-5	-8	48	0		
	↓	4	-4	-48			
4	1	-1	-12	0			
	↓	4	12				
4	1	3	0				
	↓	4					
	1	7					

#2

-3	1	1	-21	-5	160	-72	-432	432
	↓	-3	6	45	-120	-120	576	-432
-3	1	-2	-15	40	40	-192	144	0
	↓	-3	15	0	-120	240	-144	
-3	1	-5	0	40	-80	48	0	
	↓	-3	24	-72	96	-48		
-3	1	-8	24	-32	16	0		
	↓	-3	33	-171	609			
	1	-11	57	-203	625			