***Honors Pre-Calculus*** **Name** _____

***Review Problems 2.5 – 2.8*** **Period** _____

This part of the review should be done with ***NO CALCULATOR***

1. Solve: $2x^2 - 3x + 2 = 3x - 6$

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

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

$x = \frac{3 \pm \sqrt{9-16}}{2}$

$= \frac{3}{2} \pm \frac{i\sqrt{7}}{2}$

2. Solve: $(x - 2i)^2 = -9$

$x^2 - 4ix + 4i^2 = -9$

$x^2 - 4ix - 4 + 9 = 0$

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

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

$= \frac{4i \pm \sqrt{-16-20}}{2}$

$= \frac{4i \pm \sqrt{-36}}{2} = \frac{4i \pm 6i}{2} = \{5i, -i\}$

3. Find the polynomial function of least degree with real coefficients in standard form with zeros -2, $3 - i$, and f(2)=8.

$f(x) = a(x+2)(x-(3-i))(x-(3+i))$

$= a(x+2)(x^2 - (3+i)x - (3-i)x + (3+i)(3-i))$

$= a(x+2)(x^2 - 3x - ix - 3x + ix + 10)$

$= a(x+2)(x^2 - 6x + 10)$

$8 = a(2+2)(2^2 - 6(2) + 10)$

$= a(4)(2)$

$8 = 8a$

$a = 1$

$f(x) = (x+2)(x^2 - 6x + 10) = x^3 - 6x^2 + 10x + 2x^2 - 12x + 20$

$= x^3 - 4x^2 - 2x + 20$

4. For: $f(x) = x^4 + x^3 - 6x^2 - 14x - 12$

a) Find the zeros of $f(x)$

| | 1 | 1 | −6 | −14 | −12 |
|---|---|---|---|---|---|
| −1 | | 1 | 0 | −6 | −8 |
| 2 | | 1 | 3 | 0 | −14 |
| −2 | | 1 | −1 | −4 | −6 |
| | 3 | 1 | 2 | 2 | 0 |

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

$x^2 + 2x + 2 = 0$

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

$= \frac{-2 \pm \sqrt{-4}}{2}$

$= -1 \pm i$

$\{-2, 3, -1+i, -1-i\}$

b) Write the linear factorization of $f(x)$

$(x+2)(x-3)(x-(-1+i))(x-(-1-i))$

5. Find the zeros of $f(x) = x^4 - 2x^3 + 8x^2 - 6x + 15$ given that $1 - 2i$ is a zero of $f(x)$.

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

$= x^2 - 2x + 5$

$x^2 - 2x + 5 \overline{)\, x^4 - 2x^3 + 8x^2 - 6x + 15}$

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

$3x^2 - 6x + 15$

$3x^2 - 6x + 15$

$0$

$x^2 + 3 = 0$

$x^2 = -3$

$x = \pm\sqrt{-3} = \pm i\sqrt{3}$

(or use Q.F.)

$\{1-2i, 1+2i, i\sqrt{3}, -i\sqrt{3}\}$

6. For each of the following, state the equation of the vertical, horizontal, and end behavior asymptotes.

a) $f(x)=\dfrac{2x+1}{3x-1}$

V: $x=\frac{1}{3}$
H: $y=\frac{2}{3}$
EBA: $y=\frac{2}{3}$

$3x-1 \overline{)\,2x+1}$ quotient $\frac{2}{3}$, $-(2x-\frac{2}{3})$, remainder $\frac{5}{3}$

b) $f(x)=\dfrac{x}{x^2+1}$

V: none
H: $y=0$
EBA: $y=0$

c) $f(x)=\dfrac{x^2-3x-4}{x^2+3x+2}$

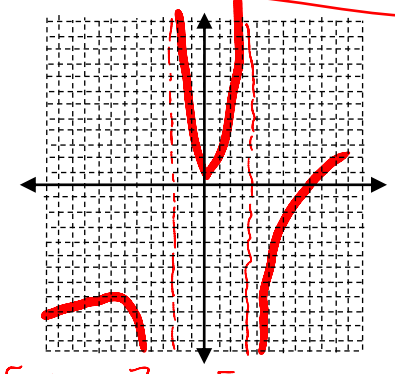
$\dfrac{(x-4)(x+1)}{(x+2)(x+1)}$

V: $x=-2$
H: $y=1$
EBA: $y=1$

d) $f(x)=\dfrac{6x^2-5x+3}{2x+1}$

$\dfrac{(3x-3)(2x-1)}{(2x+1)}$

V: $x=-\frac{1}{2}$
H: NONE
EBA: $y=3x-4$



$[-10,10]\times[-20,20]$

7. Given: $f(x)=\dfrac{x^3-4x^2+3x}{x^2-4}$, Find each of the following, then graph

$\dfrac{x(x-1)(x-3)}{(x+2)(x-2)}$

Vertical asymptote
$x=-2 \quad x=2$

Horizontal asymptote

End behavior asymptote
$y=x-4$

x-intercepts
$\{0,1,3\}$

y-intercepts
$0$

Limit statements as $x$ approaches vertical asymptotes

$\lim\limits_{x\to 2^-} f(x)=+\infty$

$\lim\limits_{x\to 2^+} f(x)=-\infty$

$\lim\limits_{x\to -2^-} f(x)=-\infty$

$\lim\limits_{x\to -2^+} f(x)=+\infty$

End behavior limit statements

$\lim\limits_{x\to +\infty} f(x)=+\infty$

$\lim\limits_{x\to -\infty} f(x)=-\infty$

8. Describe how the graph of each of the following is obtained by transforming the graph of $f(x)=\dfrac{1}{x}$.

Identify the asymptotes.

a) $f(x)=\dfrac{3}{2-x}$

Shift left 2
reflect over y-axis
vert stretch bafo 3
VA: $x=2$
HA: $y=0$

b) $f(x)=\dfrac{3x+4}{x+3}$

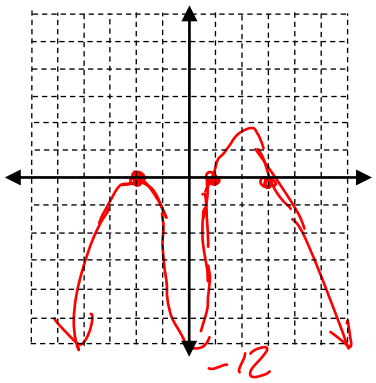
$x+3 \overline{)\,3x+4}$ quotient $3$, $3x+9$, remainder $-5$

$=3+\dfrac{-5}{x+3}$ $\left(\dfrac{1}{x+3}\right)$

Shift left 3
reflect over x axis
vertstretch bafo 5
Shift up 3

VA $x=-3$
HA $y=3$

9. a) Sketch the graph of $P(x) = -(x+2)^2(x-1)(x-3)$




b) From the graph, what is the solution of $P(x) \le 0$

$(-\infty, 1] \cup [3, \infty)$

10. Solve each of the following:

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

$\{1+\sqrt{7}, 1-\sqrt{7}\}$

b) $\frac{3x+1}{|x-1|} \ge 0$

$[-\frac{1}{3}, 1) \cup (1, \infty)$

c) $\frac{\sqrt{x+4}}{x^2-6x-7} \le 0$

$(x-7)(x+1)$

$(-1, 7) \cup \{-4\}$

d) $\frac{3}{x-4} \ge \frac{6}{x+1}$

$(-\infty, -1) \cup (4, 9]$

11. How many different quartic equations with lead coefficient of 1 can be written with <u>only</u> the roots of -1 and 3?

$(x+1)^3(x-3)$

$(x+1)^2(x-3)^2$

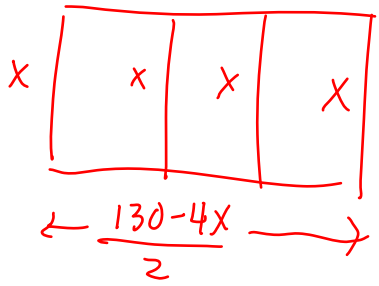
$(x+1)(x-3)^3$

3

This part of the review should be done with a ***CALCULATOR***

*For each of the following problems, state the window used to see the entire graph and make a sketch of the graph.*

12. A farmer has 130 meters of fencing with which he plans to make a rectangular pigpen. The pen is to have two internal fences running parallel to the end fences that divide the pen into three sections.
    a) Express the area "A" as a function of "x", the length of the end fence.
    b) State the domain
    c) Find the dimensions of the pen that maximizes the area.




a) $A = x\left(\frac{130-4}{2}\right)$ $A = -2x^2 + 65x$

b) $(0, 32.5)$

c) $16.25, 32.5$

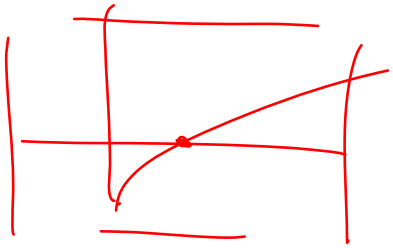
13. You are adding $x$ mL of pure acid to 200 mL of a 45% acid solution to increase the concentration of acid.
    a) Express the concentration $C(x)$ of the new mixture as a function of $x$.
    b) How much pure acid must be added to obtain a solution of 68% acid?
    c) How much pure acid must be added to obtain a solution of at least 72% acid?

| | 45% | Pure | Result |
|---|---|---|---|
| Acid | 90 | $x$ | $x+90$ |
| Mix | 200 | $x$ | $x+200$ |

a) $C(x) = \frac{x+90}{x+200}$

b) 143.75 mL

c) 19286 mL



a. Yea! I'm done and I understand this stuff – bring on the test!!

b. Oh no! I'm confused. What am I going to do? I'd better get to work. Pre-Cal party with my friends Saturday night and see my teacher for some help!!