Name________________________________________ Date________________________ Period_______

PCPAP TEST: Chapter 1.1-2.1 Form A
No Calculator

Part I: Multiple Choice. Put the CAPITAL letter in each blank to the left of the problem number.

B 1. Expand and simplify the following: $\left(3\cdot\sqrt[3]{x}-\frac{2}{x}\right)\left(5-4x^2\right)$

(A) $15\sqrt[3]{x}-12\sqrt[3]{x^7}-\frac{1}{10x}+8x$ (B) $15\sqrt[3]{x}-12\sqrt[3]{x^7}-\frac{10}{x}+8x$ (C) $15\sqrt[3]{x}-12\sqrt[7]{x^3}-\frac{10}{x}+8x$

(D) $\frac{15\sqrt[3]{x}-12\sqrt[3]{x^7}-10+8x}{x}$ (E) $15\sqrt[3]{x}-12\sqrt[3]{x^2}-\frac{1}{10x}+8x$

$\left(3x^{1/3}-2x^{-1}\right)\left(5-4x^2\right)$

FOIL: $15x^{1/3}-12x^{7/3}-10x^{-1}+8x$

$15\sqrt[3]{x}-12\sqrt[3]{x^7}-\frac{10}{x}+8x$

A 2. Find the domain of $K(x)=\frac{3\sqrt{5-x}+9}{x^2-3x-70}$. $D_K$:

(A) $(-\infty,-7)\cup(-7,5]$ (B) $(-\infty,-10)\cup(-10,5]$ (C) $(-\infty,-7)\cup(-7,-5]$

(D) $(-\infty,-10)\cup(-10,-5]$ (E) $[5,10)\cup(10,\infty)$

Radicand

$5-x\geq 0$

$-x\geq -5$

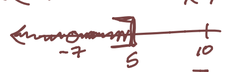
$x\leq 5$

Denominator

$x^2-3x-70\neq 0$

$(x-10)(x+7)\neq 0$

$x\neq 10,-7$




$D_K: (-\infty,-7)\cup(-7,5]$

D 3. Simplify: $\frac{5x^{-1}y^{-2}+2xy^{-1}}{x^{-2}y^2-3y}$

(A) $\frac{5x+2x^3}{y^4-3x^2y}$ (B) $\frac{5x+2x^3y}{y^4-3x^2y}$ (C) $\frac{5x^3y^4+2x^3y^3}{x^4y^4-3x^2y^3}$ (D) $\frac{5x+2x^3y}{y^4-3x^2y^3}$ (E) $\frac{5x^3+2x^3y}{y^2-3x^2y^4}$

$\frac{\frac{5}{xy^2}+\frac{2x}{y}}{\frac{y^2}{x^2}-\frac{3y}{1}}\left(\frac{\frac{x^2y^2}{1}}{\frac{x^2y^2}{1}}\right)$ $\frac{\text{LCM}}{\text{LCM}}$

$\frac{5x+2x^3y}{y^4-3x^2y^3}$

E 4. The domain of $f(x)=\dfrac{\sqrt{2x+1}-5}{(x+1)(4x+3)}$ is $D_f$:

(A) $\left[-1,\frac{-3}{4}\right)\cup\left(\frac{-3}{4},\frac{-1}{2}\right)\cup\left(\frac{-1}{2},\infty\right)$ (B) $\left[\frac{-3}{4},\frac{-1}{2}\right)\cup\left(\frac{-1}{2},\infty\right)$ (C) $\left(-1,\frac{-1}{2}\right)\cup\left(\frac{-1}{2},\infty\right)$

(D) $(-\infty,\infty)$ (E) $\left[\frac{-1}{2},\infty\right)$

Radicand
$2x+1\geq 0$
$2x\geq -1$
$x\geq -\frac{1}{2}$

Denominator
$(x+1)(4x+3)\neq 0$
$x\neq -1,\ x\neq -\frac{3}{4}$

$-1\quad -\frac{3}{4}\quad -\frac{1}{2}$

$\left[-\frac{1}{2},\infty\right)$

B 5. The domain of $f(x)=\dfrac{\sqrt[3]{x+1}}{\sqrt{2-3x}+2}$ is $D_f$:

(A) $\left(-\infty,\frac{2}{3}\right)$ (B) $\left(-\infty,\frac{2}{3}\right]$ (C) $\left(-\infty,\frac{-2}{3}\right)\cup\left(\frac{-2}{3},\frac{2}{3}\right]$

(D) $(-\infty,-1)\cup\left(-1,\frac{2}{3}\right]$ (E) $(-\infty,-1)\cup\left(-1,\frac{-2}{3}\right)\cup\left(\frac{-2}{3},\frac{2}{3}\right]$

Radicand
$2-3x\geq 0$
$-3x\geq -2$
$x\leq \frac{2}{3}$

Denominator
$\sqrt{2-3x}+2\neq 0$
$\sqrt{2-3x}\neq -2$
$2-3x\neq 4$
$-3x\neq 2$

$x\neq -\frac{2}{3}$
check:
$\sqrt{2-3(-\frac{2}{3})}+2 \overset{?}{=} 0$
$\sqrt{4}+2\overset{?}{=}0$
$4\neq 0$
Do not exclude! (extraneous)

$D_f:\left(-\infty,\frac{2}{3}\right]$

A 6. Which of the following regarding $P(x)=\dfrac{x^2-3x-10}{x^2+6x+8}$ is **true**?

(A) $P(x)$ has a hole at $\left(-2,\frac{-7}{2}\right)$ (B) $P(x)$ has a vertical asymptote at $x=4$

(C) $P(x)$ has a hole at $(-2,0)$ (D) $P(x)$ has a vertical asymptote at $x=-2$ (E) $D_P:\{x\mid x\neq -4\}$

$P(x)=\dfrac{(x-5)\cancel{(x+2)}}{(x+4)\cancel{(x+2)}}$

P has a VA @ $x=-4$
P has a hole @ $\left(-2,-\frac{7}{2}\right)$

Plug in $x=-2$
$\frac{-2-5}{-2+4}$
$-\frac{7}{2}$

C 7. How many vertical asymptotes does $J(x)=\dfrac{(x^2-x)(x^2+5x+6)}{(x^2-2x)(x^2+4x+3)}$ have?

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

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

J has holes @ $x=0,-3$
J has VAs @ $x=2,-1$
So, J has 2 VAs

Part II: Free Response

***Show all work in a logical, vertical sequence. Remember that your process and notation are worth points too, not just your answer. You must communicate your results properly, not just attain them.***

10. For the following functions,
$f(x)=\sqrt{x+5}-4$, $g(x)=\sqrt{-x+9}$, $h(x)=x^2-2x-15$ answer the following questions.

(a) Set up and simplify the **equation** for the function $K(x)=g(h(x))$, and then find the domain of $K(x)$ by sketching a graph of your radicand. **Be careful to use parentheses when substituting in for $x$, so that you may distribute any necessary values** Show the work, including the graph, that leads to your answer. Give your domain in either proper set or interval notation.

$$K(x)=\sqrt{-(x^2-2x-15)+9}$$
$$=\sqrt{-x^2+2x+15+9}$$
$$=\sqrt{-x^2+2x+24}$$

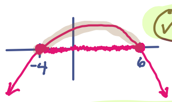
Radicand

$-x^2+2x+24\geq 0$

$-(x^2-2x-24)\geq 0$

$\underbrace{-(x-6)(x+4)}_{\text{for what x-values is the graph}}\underbrace{\geq}_{\text{on or above}} \underbrace{0}_{\text{the x-axis}}$

x-ints: $x=6$, $x=-4$




(√1) graph of any parabola opening down

$D_K: \{x \mid -4\leq x\leq 6\}$ (√2)
or $[-4,6]$

(b) Set up the **equation** for the function $R(x)=\dfrac{2x-10}{h(x)}$. Determine the equation and/or coordinates $(x,y)$, of any vertical asymptotes and holes, respectively. Show the work that leads to your answer, and use proper notation.

$$R(x)=\frac{2x-10}{x^2-2x-15}$$
$$=\frac{2(x-5)}{(x-5)(x+3)}$$
$$=\frac{2}{x+3},\ x\neq 5$$

plug in $x=5$

$\frac{2}{(5)+3}$

$\frac{2}{8}$

$\frac{1}{4}$

$R$ has a VA @ $x=-3$ (√3)

$R$ has a hole at $\left(5, \frac{1}{4}\right)$ (√4) (√5)

(c) Set up the **equation** for the function $J(x)=\dfrac{h(x)}{f(x)}$, and then find the domain of $J(x)$. Show the work that leads to your answer. Give your domain in either proper set or interval notation.

$$J(x)=\frac{x^2-2x-15}{\sqrt{x+5}-4}$$

Radicand

$x+5\geq 0$

$x\geq -5$

Denominator

$\sqrt{x+5}-4\neq 0$

$\sqrt{x+5}\neq 4$

$(\sqrt{x+5})^2\neq (4)^2$

$x+5\neq 16$

$x\neq 11$

check: $\sqrt{11+5}-4\stackrel{?}{=}0$

$\sqrt{16}-4\stackrel{?}{=}0$

$4-4\stackrel{?}{=}0$

$0=0$ ✓

so, $D_J:\{x\,|\,x\geq -5, x\neq 11\}$ √6 √7

or

$D_J: [-5,11)\cup(11,\infty)$

(d) Set up and **completely simplify** $\dfrac{h(x+w)-h(x)}{w}$ for some constant $w$. Show the work that leads to your answer.

$h(x)=x^2-2x-15$

$h(\quad)=(\quad)^2-2(\quad)-15$

$$\frac{h(x+w)-h(x)}{w}$$

$$\frac{[(x+w)^2-2(x+w)-15]-[x^2-2x-15]}{w}$$

√8 Setup & process

$$\frac{x^2+2xw+w^2-2x-2w-15-x^2+2x+15}{w}$$

$$\frac{\cancel{x^2}+2xw+w^2\cancel{-2x}-2w\cancel{-15}\cancel{-x^2}\cancel{+2x}\cancel{+15}}{w}$$

$$\frac{2xw+w^2-2w}{w}$$

$$\frac{\cancel{w}(2x+w-2)}{\cancel{w}}$$

$2x+w-2$ √9