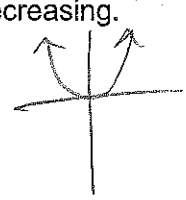
Name: Key Date: _____ Hour: ____

Chapter 2 Study Guide - PreCalculus

Section 2.1 - Power and Radical Functions

Analyze each function. Describe the domain, range, intercepts, end behavior, continuity, and where the function is increasing/decreasing.

1) $f(x) = 5x^6$



Domain: $(-\infty,\infty)$
Range: $(0,\infty)$
x-int: $(0,0)$
y-int: $(0,0)$
End Beh: $\lim_{x\to-\infty} f(x)=\infty$, $\lim_{x\to\infty} f(x)=\infty$
Continuity: Yes, thru entire domain
Increasing/Decreasing:
$\to (0,\infty)$ $\to (-\infty,0)$

2) $f(x) = x^{-9}$

Domain: $(-\infty,0)\cup(0,\infty)$
Range: $(-\infty,0)\cup(0,\infty)$
x-int: $\emptyset$
y-int: $\emptyset$
End Beh: $\lim_{x\to-\infty} f(x)=0$, $\lim_{x\to\infty} f(x)=0$
Continuity: Discontinuous @ $x=0$
Increasing/Decreasing: Inc: $(0,\infty)$ Dec: $(-\infty,0)$

3) $f(x) = -8x^3$

Domain: $(-\infty,\infty)$
Range: $(-\infty,\infty)$
x-int: $(0,0)$
y-int: $(0,0)$
End B: $\lim_{x\to\infty} f(x)=-\infty$ $\lim_{x\to-\infty} f(x)=\infty$
Continuity: thru $(-\infty,\infty)$
Inc/Decreasing: Decreasing $(-\infty,\infty)$

4) $f(x) = \sqrt{5x-6}-11$

Domain: $(1.2,\infty)$
Range: $(-11,\infty)$
x-int: $(25.4, 0)$
y-int: $\emptyset$
End B: $\lim_{x\to\infty} f(x)=\infty$
Continuity: Yes, thru $(1.2,\infty)$
Inc/Dec: Increasing from $(1.2,\infty)$

5) Solve the equations.

a) $2x = 4+\sqrt{7x-12}$

$x=4$
$x=1.75$

b) $\sqrt[4]{x^2+31}-1=3$

$x=15$
$x=-15$

Section 2-2: Polynomial Functions

Describe the end behavior of the graph of each polynomial function using limits. Explain your reasoning using the leading term test.

6) $f(x) = -4x^4 + 7x^3 - 8x^2 + 12x - 6$

Degree: even
LC: negative
$\lim_{x\to\infty} f(x)=-\infty$
$\lim_{x\to-\infty} f(x)=-\infty$

7) $f(x) = x^3(x-5)(x+7)$

Degree: odd
LC: positive
$\lim_{x\to\infty} f(x)=\infty$
$\lim_{x\to-\infty} f(x)=-\infty$

State the number of possible real zeros and turning points of each function. Then, determine all of the real zeros by factoring.

8) $f(x) = x^3 - 7x^2 + 12x$

3 real zeros
2 turning pts

$x(x-3)(x-4)$

9) $f(x) = x^4 - 10x^2 + 9$

4 real zeros
3 turning pts

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

Section 2-3: The Remainder and Factor Theorems

For 10 and 11, divide using long division.

10) $(x^3 + 8x^2 - 5) \div (x - 2)$

$x^2+10x+20$

R: 35

11) $(-3x^3 + 5x^2 - 22x + 5) \div (x^2 + 4)$

$-3x+5$

R: $-10x-15$

For 12 and 13, divide using synthetic division.

12) $(x^4 - x^3 + 7x^2 - 9x - 18) \div (x - 2)$

x^3+x^2+9x+9

13) $(x^3 + 3x^2 - 8x - 24) \div (x + 3)$

x^2 ~~[illegible]~~ -8

~~[illegible]~~ R: 0

Use the Factor Theorem to determine if binomials given are factors of f(x). Use the binomials that are factors to write a factored form of f(x).

14) $f(x) = 2x^4 - 9x^3 + 2x^2 + 9x - 4$; $(x - 1)$, $(x + 1)$

yes yes

$2x^4-9x^3+2x^2+9x-4 =$
$(x-1)(x+1)(x-4)(2x-1)$

14.5) List all the possible zeros of the polynomial $4x^5 + 2x^3 + 2x^2 - x + 18$.

$$\frac{\text{Factors of } 18}{\text{Factors of } 4} = \frac{\pm1, \pm2, \pm3, \pm6, \pm9, \pm18}{\pm1, \pm2, \pm4}$$

$\pm1, \pm2, \pm3, \pm6, \pm9, \pm18, \pm1/2, \pm3/2, \pm9/2, \pm1/4, \pm3/4, \pm9/4, \pm18/4$

2-4: Zeros of Polynomial Functions

List all possible rational zeros of each function. Then, determine which are zeros.

factors 15 / factor 1

15) $f(x) = x^3 - x^2 - x + 1$

poss. Zeros: ± 1

actual zeros:
-1, 1 (multiplicity 2)

16) $f(x) = x^3 - 14x - 15$

$\pm 1, \pm 3, \pm 5, \pm 15$

zero: -3

2-5: Rational Functions ★ You will be asked to find intercepts, too! ★

Find the domain of each function, as well as the equations for the vertical or horizontal asymptotes, if any.

17) $\frac{x^2-1}{x+4}$

D: $(-\infty, -4) \cup (-4, \infty)$

VA: $x = -4$

HA: $\varnothing$

18) $f(x) = \frac{x^2}{x^2-25}$

D: $(-\infty, -5) \cup (-5, 5) \cup (5, \infty)$

VA: $x = 5$, $x = -5$

HA: $y = 1$

19) $f(x) = \frac{x^2-16}{x^3-6x^2+5x}$

D: $(-\infty, 0) \cup (0, 1) \cup (1, 5) \cup (5, \infty)$

VA: $x = 0$, $x = 5$, $x = 1$

HA: $y = 0$

20) Solve the equation $(12/x) + x - 8 = 1$

$\frac{9 \pm \sqrt{33}}{2} \rightarrow$ $x \approx 1.63$, $x \approx 7.37$

$\frac{9 \pm \sqrt{(-9)^2 - 4(1)(12)}}{2(1)}$

****PLEASE keep in mind: You may not have "word-for-word" questions like this on your test, BUT the majority of what's on this study guide will be on your test!****