HPCT3
UNIT 8: Limits & Discontinuity – STUDY GUIDE

Name: Key 2017-18
Date: _____

UNIT 8 TEST STUDY GUIDE

Section 1 Rational Function Review of Finding Discontinuity
- ✓ Point (Holes come from repeated in the numerator and denominator)
- ✓ Infinite (Asymptotes-VA come from remaining factors in the demom... HA versus SA cases)
- ✓ X-intercepts (set remaining factors in the numerator=0 and solve after cancelling holes)
- ✓ Y-intercepts (plug in zero for x, reduce the constants that are leftover)
- ✓ Synthetic & Long Division to get Slant Asymptotes when the Num > Denom by 1 power.

Section 2 Determining Limits from a Graph
- ✓ Left-Side and Right-Side Limits
- ✓ Overall Limits

Section 3 Determining Limits
- ✓ Direct Substitution
- ✓ Algebraic Simplification followed by direct substitution
- ✓ Calculator (using TableSet, then table to be more exact) or TRACE (to approximate) limits

Section 4 Infinite Limits ($x \to c$, where a VA lies at c!)
Plugging in c + or – .001 depending on the side of c that we care about to test

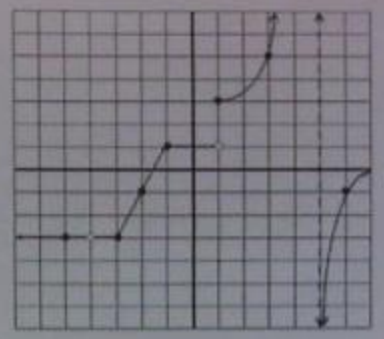
Section 5 Limits at Infinity ($x \to \infty$) OR ($x \to -\infty$), using HA or SA or Parent Graph or Direct Sub (if easier)
Dividing all terms by largest power of variable in the denominator when necessary (if harder)

Section 6 Other Methods for determining Limits
- ✓ Table of Values
- ✓ Use of a Graph
- ✓ Rationalizing the Numerator
- ✓ Complex Fractions

Section 7 Determining Continuity/Types of Discontinuity
- ✓ Point (Hole) (REMOVABLE DISC)
- ✓ Infinite (Asymptotes)
- ✓ Jump
- ✓ Non-existence

Section 8 Piecewise Functions
- ✓ Determining 1-Sided Limits
- ✓ Determining Overall Limits
- ✓ Determining the value (height) of a function at a particular x-value
- ✓ Determining whether a function is continuous

1.



a) $\lim_{x\to 5^-} f(x) = \infty$ b) $\lim_{x\to -4} f(x) = -3$ c) f(1)= 3

d) $\lim_{x\to -1} f(x) = 1$ e) $\lim_{x\to 1} f(x) =$ DNE f) f(5) = ∞

g) $\lim_{x\to -1} f(x) = 1$ h) $\lim_{x\to 5} f(x) =$ DNE i) f(-4)= ∅

j) $\lim_{x\to 5^+} f(x) = -\infty$ k) $\lim_{x\to -4} f(x) = -3$ l) f(3)= 5 m) $\lim_{x\to -4} f(x) = -3$ n) f(-1)= 1

o) For which value(s) of x does the limit **not exist**? x = 1, 5

p) For which value(s) of x is the graph discontinuous? x= -4, 1, 5 ← infinite (VA)
removable discontinuity (hole) jump

2. ***State all Holes and Asymptotes for a and b and then write the equation for c and d:***

a) $g(x) = \dfrac{x+2}{x-5}$

HOLE: ____
VA: x = 5
HA: y = 1
SA: ____

b) $f(x) = \dfrac{x^3}{x^2 - 4x - 96}$

$x^3 + 0x^2 + 0x + 0$ ÷ $x^2 - 4x - 96$

$-(x^3 - 4x^2 - 96)$

$4x^2 \ldots$

$(x-12)(x+8)$

HOLE: ____
VA: x = 12, x = -8
HA: ____
SA: y = x + 4

c) Hole(s): x = -1
VA: x = 5, -5
HA: y = 1

$\dfrac{x^2(x+1)}{(x^2-25)(x+1)}$

f(x) = $\dfrac{x^2 + x^3}{x^3 - 25x + x^2 - 25}$

d) Hole(s): x = 2, 7
VA: x = 1, -3
HA: y = 0

$y = \dfrac{(x-2)(x-7)}{(x-7)(x-1)(x+3)(x-2)}$

f(x) = $\dfrac{x^2 - 9x + 14}{\quad + \quad}$

$(x-7)(x-1)(x+3)(x-2)$

↑ ok to leave since 4th degree

↓

$f(x) = \dfrac{x^3 + x^2}{x^3 + x^2 - 25x - 25}$