Calculus Homework Assignment Name_____

Infinite and Removable Discontinuities

Date_____ Period____

Determine if each function is continuous. If the function is not continuous, find the *x*-axis location of each discontinuity and classify each discontinuity as infinite or removable.

1) $f(x) = \dfrac{x+7}{x^2-x-2}$ $= \dfrac{x+7}{(x-2)(x+1)}$

V.A: ~~x=-1~~ $x=-1$, $x=2$

HA: $y=0$

$D: (-\infty,-1)\cup(-1,2)\cup(2,\infty)$

~~D: (-∞,2)∪(2,∞)~~ $R: (-\infty,0)\cup(0,\infty)$

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

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

$x=-1$ VA

No HA

~~R: (-∞,∞)~~ $(-\infty,-4]\cup[0,\infty)$

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

$x=-2$ Hole → $f(-2) = -\frac{1}{5}$

$x=3$ VA

HA $y=0$

$D: (-\infty,-2)\cup(-2,3)\cup(3,\infty)$

$R: (-\infty,-\frac{1}{5})\cup(-\frac{1}{5},0)\cup(0,\infty)$

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

Hole ↓ $f(0) = -1$

$x=0$ Hole

No HA

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

$R: (-\infty,-1)\cup(-1,\infty)$

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

No Holes/VA/HA

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

$R: (-\infty,\infty)$

6) $f(x) = \dfrac{x^2+5x+4}{x+1}$ $= \dfrac{(x+4)(x+1)}{(x+1)} = x+4$

Hole $f(-1) = 3$

$x=-1$ Hole

No HA

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

$R: (-\infty,3)\cup(3,\infty)$

7) $f(x) = \dfrac{x-4}{\sqrt{x+2}}$

No Holes/VA/HA

$x \geq 0$

$D: [0,\infty)$

$R: [-2,\infty)$

8) $f(x) = \dfrac{x-2}{x^3-4x}$ $\dfrac{x-2}{x(x^2-4)} = \dfrac{x-2}{x(x+2)(x-2)} = \dfrac{1}{x(x+2)}$

VA $x=0$/$x=-2$

Hole $x=2$

$f(2) = \frac{1}{8}$

This hole is filled in on the left

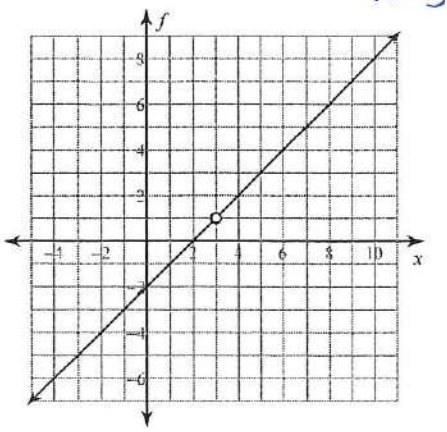
HA $y=0$

$D: (-\infty,-2)\cup(-2,0)\cup(0,\infty)$

$R: (-\infty,-1)\cup(0,\frac{1}{8})\cup(\frac{1}{8},\infty)$ $(0,\infty)$

Determine if each function is continuous. If the function is not continuous, find the x-axis location of any discontinuities and classify each discontinuity as infinite or removable.

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

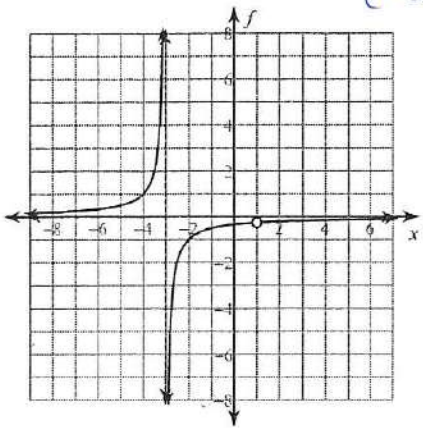


$x = 3$ Hole

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

$R: (-\infty, 1) \cup (1, \infty)$

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



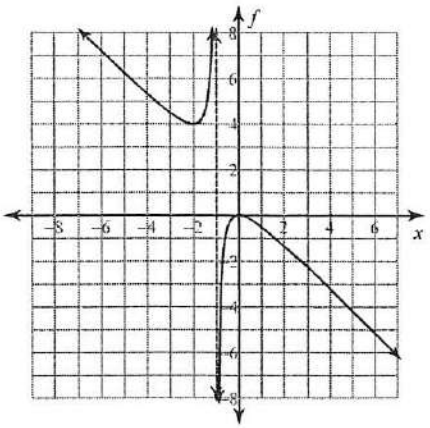
$x = 1$ Hole

$x = -3$ VA

$D: (-\infty, -3) \cup (-3, 1) \cup (1, \infty)$

$R: (-\infty, -\frac{1}{4}) \cup (-\frac{1}{4}, 0) \cup (0, \infty)$

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

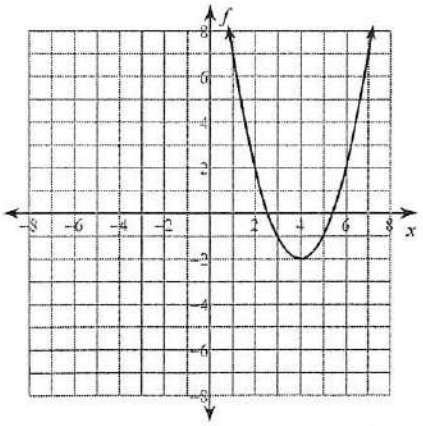


$x = -1$ VA

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

$R: (-\infty, 0] \cup [4, \infty)$

12) $f(x) = x^2 - 8x + 14$



None

Continuous

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

$R: [-2, \infty)$