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: $x \neq 2$ $x = -1$
$x = 2$

HA: $y = 0$

$D\mathring{o} (-\infty, -1) \cup (-1, 2) \cup (2, \infty)$

$D\mathring{o} (-\infty, 2) \cup (2, \infty)$ $R\mathring{o} (-\infty, 0] \cup (0, \infty)$
-3.3

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

$D\mathring{o} (-\infty, -1) \cup (-1, \infty)$

$x = -1$ VA

$R\mathring{o} (-\infty, \infty)$
$(-\infty, -4] \cup [0, \infty)$

No HA

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

$f(-2) = -\frac{1}{5}$

$x = -2$ Hole $\to$ $D\mathring{o} (-\infty, -2) \cup (-2, 3) \cup (3, \infty)$

$x = 3$ VA

HA $y = 0$

$R\mathring{o}$ ~~(-∞,∞)~~ $(-\infty, -\frac{1}{5}) \cup (-\frac{1}{5}, 0) \cup (0, \infty)$

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

Hole
↓
$f(0) = 1$

$x = 0$ Hole $D\mathring{o} (-\infty, 0) \cup (0, \infty)$

NO HA $R\mathring{o} (-\infty, -1) \cup (-1, \infty)$

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

No Holes/VA/HA

$D\mathring{o} (-\infty, \infty)$
$R\mathring{o} (-\infty, \infty)$

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

$D\mathring{o} (-\infty, -1) \cup (-1, \infty)$

$R\mathring{o} (-\infty, 3) \cup (3, \infty)$

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

No Holes/VA/HA

$x \geq 0$

$D\mathring{o} [0, \infty)$

$R\mathring{o} [-2, \infty)$

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

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

VA $x = 0 / x = -2$

Hole $x = 2$

HA $y = 0$

This hole is filled in on the left

$D\mathring{o} (-\infty, -2) \cup (-2, 0) \cup (0, \infty)$

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

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.

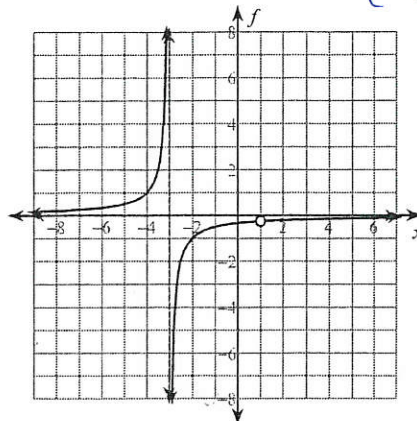9) $f(x) = \dfrac{x^2 - 5x + 6}{x - 3}$ $= \dfrac{(x-3)(x-2)}{x-3}$
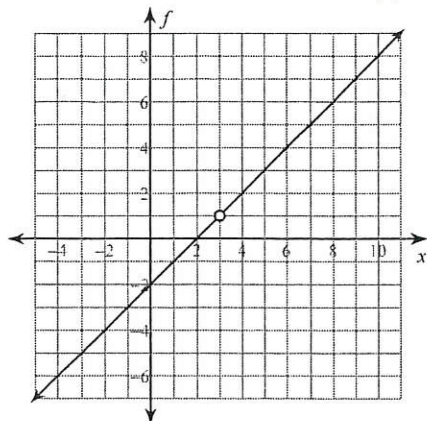
$x = 3$ Hole

$D° (-\infty, \infty)$

$R° (-\infty, 1) \cup (1, \infty)$

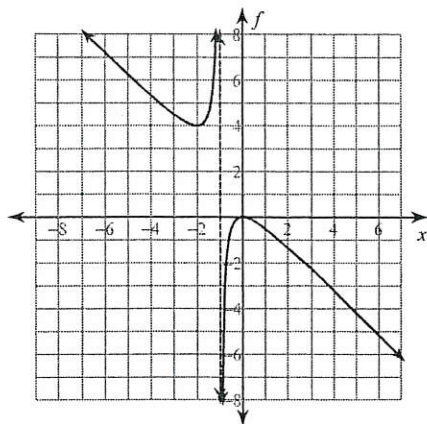10) $f(x) = -\dfrac{x - 1}{x^2 + 2x - 3}$ $= \dfrac{-(x-1)}{(x+3)(x-1)} = \dfrac{-1}{(x+3)}$

$x = 1$ Hole

$x = -3$ VA

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

$R° (-\infty, -\tfrac{1}{4}) \cup (-\tfrac{1}{4}, 0) \cup (0, \infty)$
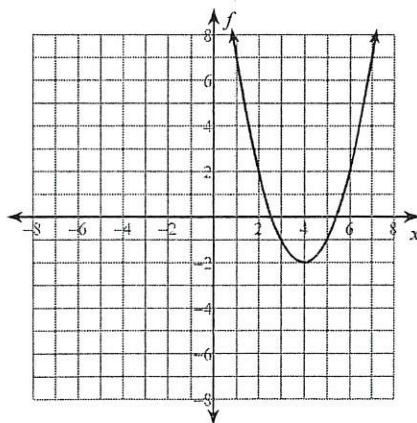
11) $f(x) = -\dfrac{x^2}{x + 1}$

$x = -1$ VA

$D° (-\infty, -1) \cup (-1, \infty)$

$R° (-\infty, 0] \cup [4, \infty)$

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

None

Continuous

$D° (-\infty, \infty)$

$R° [-2, \infty)$