Solutions — **Practice**

| For each function identify the type of each discontinuity and where it is located. |

1. $f(x) = \dfrac{x}{x+1} = 0$

V.A. at $x = -1$

2. $f(x) = \dfrac{x^2}{x^2+3x} = \dfrac{\cancel{x}}{\cancel{x}(x+3)}$

hole at $x = 0$

V.A. at $x = -3$

3. $f(x) = x^3 - 4x$

Continuous function

(no discontinuities)

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

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

hole at $x = -3$

5. $f(x) = \dfrac{x+2}{x^2-2x-8}$

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

hole at $x = -2$

V.A. at $x = 4$

6. $f(x) = \sec 2x$ for $0 \le x \le 2\pi$ V.A. at

$\dfrac{1}{\cos 2x} \rightarrow = 0$

$2x = \frac{\pi}{2}$ $2x = \frac{3\pi}{2}$ $2x = \frac{5\pi}{2}$

$x = \frac{\pi}{4}$ $x = \frac{3\pi}{4}$ $x = \frac{5\pi}{4}$

$2x = \frac{7\pi}{2}$ $2x = \frac{9\pi}{2}$

$x = \frac{7\pi}{4}$ $\cancel{x = \frac{9\pi}{4}}$

7. $f(x) = \dfrac{x-5}{x^2-7x+10} = \dfrac{\cancel{x-5}}{(\cancel{x-5})(x-2)}$

hole at $x = 5$

V.A. at $x = 2$

8. $f(x) = \dfrac{2x}{2x-5} = 0$

$2x = 5$

$x = \frac{5}{2}$

V.A. at $x = \frac{5}{2}$

9. $f(x) = \dfrac{4x+5}{3}$

Continuous Function

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

$\dfrac{\cancel{x-1}}{(\cancel{x-1})(x+4)}$

hole at $x = 1$

V.A. at $x = -4$

11. $f(x) = \dfrac{x^2-16}{x-4}$

$\dfrac{(\cancel{x-4})(x+4)}{\cancel{x-4}}$

hole at $x = 4$

12. $f(x) = \csc\left(\dfrac{x}{2}\right)$ for $0 \le x \le 2\pi$ V.A. at

$\dfrac{1}{\sin\left(\frac{x}{2}\right)} \rightarrow = 0$

$\frac{x}{2} = 0$ $\frac{x}{2} = \pi$ $\frac{x}{2} = 2\pi$

$x = 0$ $x = 2\pi$ $\cancel{x = 4\pi}$
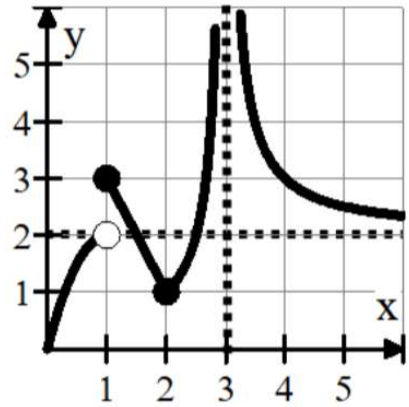
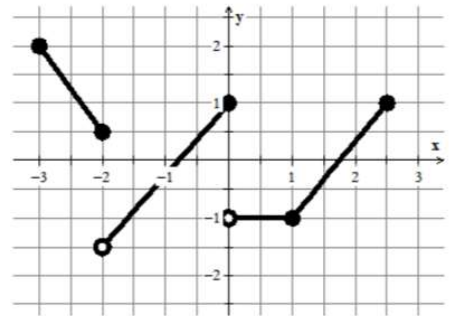13. The graph of the function $f(x)$ is shown to the right:

E

Which of the following statements is true about f?

✗ I. f is undefined at $x = 1$.

✗ II. f is defined but not continuous at $x = 2$.

✗ III. f is defined and continuous at $x = 3$.

(A) Only I   (B) Only II   (C) I and II   (D) I and III   (E) None of the statements are true.

Questions 14 through 16 are based on the function $f(x)$ shown in the graph on the right.

14. The function $f(x)$ has a removable discontinuity at:

(A) $x = -2$ only   (B) $x = 0$ only   (C) $x = 1$ only

E

(D) $x = -2$ and $x = 0$ only   (E) $f(x)$ has no removable discontinuities.

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15. On what intervals is $f(x)$ continuous?   C

(A) $[-3, -2] \cup [-2, 0] \cup [0, 2.5]$ (B) $[-3, -2] \cup (-2, 0] \cup [0, 2.5]$

(C) $[-3, -2] \cup (-2, 0] \cup (0, 2.5]$ (D) $[-3, -2] \cup [-2, 0] \cup (0, 2.5]$

(E) $[-3, -2] \cup (-2, 0] \cup (0, 1) \cup (1, 2.5]$

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16. The function has a jump discontinuity at: D

(A) $x = -2$ only   (B) $x = 0$ only   (C) $x = 1$ only

(D) $x = -2$ and $x = 0$ only   (E) $f(x)$ has no jump discontinuities.