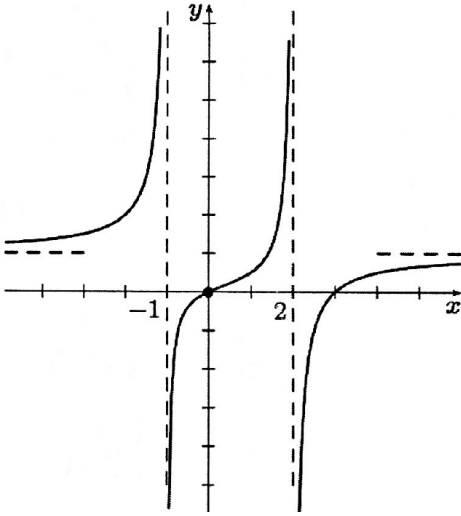1. Use the graph of the function $f(x)$ to answer each question. Use $\infty, -\infty$ or DNE where appropriate.

a) $f(0)$

b) $f(2)$

c) $\lim_{x\to-1} f(x)$

d) $\lim_{x\to 0} f(x)$

e) $\lim_{x\to 2^+} f(x)$

f) $\lim_{x\to\infty} f(x)$

g) $f(3)$

2. Consider the piece-wise function $f(t) = \begin{cases} t^2 & for\ t < -2 \\ \frac{t+6}{t^2-t} & for\ -1 < t < 2 \\ 3t - 2 & for\ t \geq 2 \end{cases}$

Find the following.

a) $f\left(-\frac{3}{2}\right)$

b) $f(2)$

c) $f\left(\frac{3}{2}\right)$

d) $\lim_{t\to-2} f(t)$

e) $\lim_{t\to-1^+} f(t)$

f) $\lim_{t\to 2} f(t)$

g) $\lim_{t\to 0} f(t)$

3. Consider $f(x) = \begin{cases} sin\pi x & for\ x \leq 1 \\ 2^{x^2} & for\ x > 1 \end{cases}$. Is the function continuous? Justify your answer.

4. Find the value of the parameter k to make the following limit exist and be finite. What is then the value of the limit?

$$\lim_{x\to 5} \frac{x^2 + kx - 20}{x - 5}$$

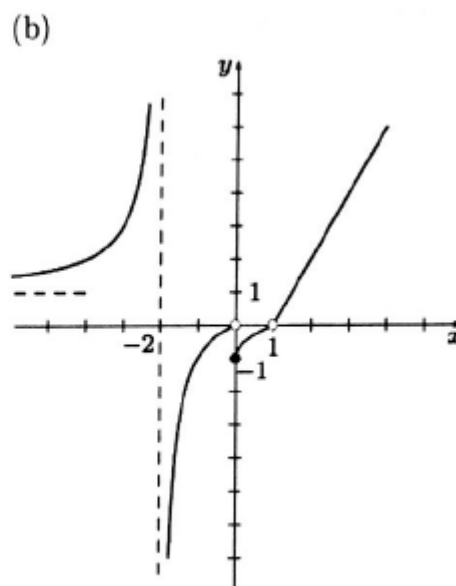5. For each function determine the intervals of continutiy.

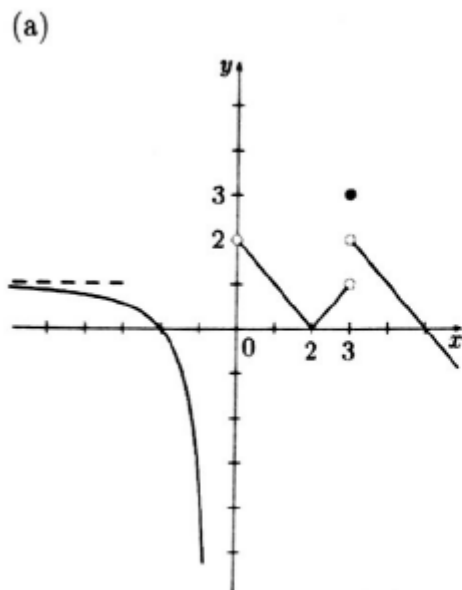(a) $f(x) = x^2 + e^x$

(b) $f(x) = \frac{3x + 1}{2x^2 - 3x - 2}$

(c) $f(x) = \sqrt[3]{5 - x}$

(d)* $f(x) = \frac{2}{4 - x^2} + \frac{1}{\sqrt{x^2 - x - 12}}$

6. For each graph, determine where the function is discontinuous. Justify for each point by:

(i)   Saying which condition fails in the definition of continuity

(ii)   Mentioning which type of discontinuity it is.

(a)

(b)

7. Determine whether the following functions are continuous. If not, justify your answer.

(a) $f(x) = \begin{cases} 2^x - 3x^2 & \text{for } x \le 1 \\ \log_{10}(x) + x & \text{for } x > 1 \end{cases}$

(b) $f(x) = \begin{cases} \frac{2x}{3-x} & \text{for } x \le 0 \\ x^2 - 3x & \text{for } 0 < x < 2 \\ \frac{x^2-8}{x} & \text{for } x > 2 \end{cases}$

8. For what value(s) of the parameter c (if possible), to make the given function continuous everywhere.

$$f(x) = \begin{cases} 2cx + (x-1)^2 & for\ x > 1 \\ 2(cx)^3 + x - 1 & for\ x \le 1 \end{cases}$$

Answers

1. A)0 B) DNE C) DNE D) 0 E) -∞ F) 1 G) 0   2. A) DNE B) 4 C) 10 D) DNE E) 4 G) DNE

3. Jump Discontinuity – Condition 2 fails 4. $k = -1$, 9   5. R B) $x \ne -\frac{1}{2}, 2$ C) $(-\infty, 5]$ D)

$(-3, -2) \cup (-2,2) \cup (2,4)$ 6. A) $x = 0,3$ B) $x = -2,0,1$ 7. A) $x = 1$ b) $x = 2$ 8. C=-1, 0,

1