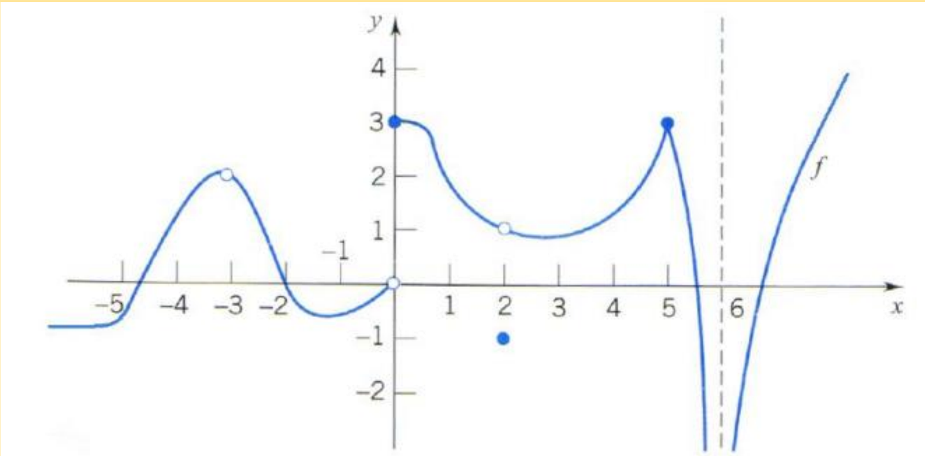
Question 1 **1 Mark for each, except 6 (4 marks)**

Use the graph below to answer the following (**if any**):

1. $f(2)$
2. $\lim_{x \to 0} f(x)$
3. Find the domain of f .
4. Find the vertical asymptote(s) for f .
5. Find the horizontal asymptote(s) for f .
6. Find the x- values at which f is discontinuous.



Answer:

Question 2 **2 Marks for each**

Use the definition of limit to show the following:

1. $\lim_{x \to 2}(3x-2)=4$.

2. $\lim_{x \to 4^+}\sqrt{x-4}=0$.

Answer:

Question 3 **3 Marks for each, except 3 (4 marks)**

Find all horizontal and vertical asymptotes for the following functions **(if any):**

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

2. $g(x)=\dfrac{3x^3+7x^2+2}{-4x^3+5}$.

3. $h(x)=\begin{cases} \dfrac{4x}{x-4} & \text{if } x<0 \\ \dfrac{x^2}{x-2} & \text{if } 0\le x<2 \\ \dfrac{\cos x}{x+1} & \text{if } x\ge 2 \end{cases}$.

Answer:

Question 4 **3 Marks for each**

A. For which value of the constant c is function f continuous on $(-\infty, \infty)$

$$f(x) = \begin{cases} cx^2 + 2x & \text{if } x < 2 \\ x^3 - cx & \text{if } x \geq 2 \end{cases}.$$

B. Use the intermediate value theorem to show that there is some u with $0 \leq u \leq 2$ s.t $u^2 + \cos \pi u = 4$.

Answer:

Question 5 **2 Marks for each, except 2and 6 (3 marks)**

Find the following limits (if exist):

1. $\lim_{x\to 0}\frac{\sqrt{x+1}-1}{x}$.

2. $\lim_{x\to 0} x^4 \sin\frac{\pi}{x}$.

3. $\lim_{t\to -1}\frac{t+1}{|t+1|}$.

4. $\lim_{x\to\infty}\frac{\sqrt{7+9x^2}}{1-2x}$.

5. $\lim_{x\to 5}\frac{2\tan(x-5)}{x^2-6x+5}$.

6. $\lim_{x\to 1}\sin(\frac{x^2+x-2}{6(x-1)})$.

Answer:

Question 6 **2 Marks for each, except B (4 marks)**

A. By using the definition of derivative $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ find:

1. $f'(x)$ if $f(x)=x^2-2x$.
2. The slope of the tangent line to the graph of f at $x=2$.
3. The equation of the tangent line to the graph of f at the point $(2,0)$.

B. Show whether or not the function $g(x)=\begin{cases}\sqrt{x}\text{-}3 & \text{if } x>1\\ \frac{1}{2}\text{x-}\ \frac{5}{2} & \text{if } x\le 1\end{cases}$ is differentiable at $x=1$.

Answer:

Question 7 **2 Marks for each, except B (3 marks)**

A. Use the differentiation rules to find the derivative of the following functions:

1. $f(x)=10\sqrt[5]{x^3}-\sqrt{x^7}-4$.
2. $h(x)=\dfrac{(1-3x)(2x+1)}{(3x-2)}$.

B. find x-coordinates of points where the tangent line to the graph of the given function is horizontal:

$$g(x)=(x+2)(x^2-2x-8).$$

Answer: