Question 1

Find

$$\lim_{x \to 2} \frac{x^2 - 2x - 1}{x - 3}$$

(if the limit exists)

1. 4
2. 2
3. 3
4. 1
5. does not exist
6. None of the above

Question 1

Find

$$\lim_{x \to 2} \frac{x^2 - 2x - 1}{x - 3}$$

(if the limit exists)

1. 4
2. 2
3. 3
4. 1
5. does not exist
6. None of the above

4. The limit is 1

Question 1

Using direct substitution the limit is:

$$\lim_{x \to 2} \frac{x^2 - 2x - 1}{x - 3} = \frac{4 - 4 - 1}{2 - 3} = 1$$

Question 2

Find

$$\lim_{x \to -2} \frac{x-1}{x+3}$$

(if the limit exists)

1. -3
2. -2
3. 3
4. 1
5. does not exist
6. None of the above

Question 2

Find

$$\lim_{x \to -2} \frac{x-1}{x+3}$$

(if the limit exists)

1. -3
2. -2
3. 3
4. 1
5. does not exist
6. None of the above

1. The limit is -3

Question 2

By direct substitution, the limit is:

$$\lim_{x \to -2} \frac{x-1}{x+3} = \frac{-2-1}{-2+3} = -3$$

Question 3

Find

$$\lim_{x \to 6} \frac{x^2 - 9x + 2}{x^2 + 4}$$

(if the limit exists)

1. -3/5
2. 2/5
3. 3
4. -2/5
5. does not exist
6. None of the above

Question 3

Find

$$\lim_{x \to 6} \frac{x^2 - 9x + 2}{x^2 + 4}$$

(if the limit exists)

1. -3/5
2. 2/5
3. 3
4. -2/5
5. does not exist
6. None of the above

4. The limit is -2/5

Question 3

By direct substitution,

$$\lim_{x \to 6} \frac{x^2 - 9x + 2}{x^2 + 4} = \frac{36 - 54 + 2}{40} = \frac{-16}{40} = \frac{-2}{5}$$

Question 4

Find

$$\lim_{x \to -1} \frac{x^2 - 1}{x + 1}$$

(if the limit exists)

1. -3
2. -2
3. 3
4. 1
5. does not exist
6. None of the above

Question 4

Find

$$\lim_{x \to -1} \frac{x^2 - 1}{x + 1}$$

(if the limit exists)

1. -3
2. -2
3. 3
4. 1
5. does not exist
6. None of the above

2. The limit is -2

Question 4

We cannot use direct substitution because the denominator vanishes at $x = -1$. However,

$$\frac{x^2 - 1}{x + 1} = \frac{(x - 1)(x + 1)}{x + 1} = x - 1 \quad \text{if } x \neq -1$$

so

$$\lim_{x \to -1} \frac{x^2 - 1}{x + 1} = \lim_{x \to -1} x - 1 = -2$$

by direct substitution

Question 5

Find

$$\lim_{x \to 1} \frac{x-3}{x-1}$$

(if the limit exists)

1. $-\infty$
2. -2
3. 3
4. ∞
5. does not exist
6. None of the above

Question 5

Find

$$\lim_{x \to 1} \frac{x-3}{x-1}$$

(if the limit exists)

1. $-\infty$
2. -2
3. 3
4. ∞
5. does not exist
6. None of the above

5. The limit does not exist

Question 5

We cannot use direct substitution because the denominator vanishes at $x = 1$. However, we can see that the limit does not exist because

$$\lim_{x \to 1^+} \frac{x-3}{x-1} = -\infty$$

and

$$\lim_{x \to 1^-} \frac{x-3}{x-1} = +\infty$$

so the left and right hand limits exist but are not equal.

Question 6

Find

$$\lim_{x \to 1} \frac{x-3}{x^2-2x+1}$$

(if the limit exists)

1. $-\infty$
2. -2
3. 3
4. ∞
5. does not exist
6. None of the above

Question 6

Find

$$\lim_{x \to 1} \frac{x-3}{x^2-2x+1}$$

(if the limit exists)

1. $-\infty$
2. -2
3. 3
4. ∞
5. does not exist
6. None of the above

5. The limit is $-\infty$

Question 6

We cannot use direct substitution because the denominator vanishes at $x = 1$. However, we can see that

$$\lim_{x \to 1^+} \frac{x-3}{(x-1)^2}$$

so the denominator is always positive and since the numerator is negative at $x = 1$,

$$\lim_{x \to 1^+} \frac{x-3}{x-1} = -\infty$$

and

$$\lim_{x \to 1^-} \frac{x-3}{x-1} = -\infty$$

so the two-sided limit is $-\infty$