Calculus 1 - Limits

Worksheet 4

Evaluating Limits by Factoring, Part 2

Calculus 1 - Limits - Worksheet 4 – Evaluating Limits by Factoring, Part 2

1. Evaluate this limit.

$$\lim_{x \to 0} \frac{(4+x)^2 - 16}{x}$$

2. Evaluate this limit.

$$\lim_{x \to 0} \frac{5x^3 + 8x^2}{3x^4 - 16x^2}$$

3. Evaluate this limit.

$$\lim_{x \to 0} \frac{(2+x)^3 - 8}{x}$$

4. Evaluate this limit.

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

5. Evaluate this limit.

$$\lim_{x \to 4} \frac{2x^2 - 12x + 16}{x^2 - x - 12}$$

6. Evaluate this limit.

$$\lim_{x \to -3} \frac{x^2 + 2x - 3}{-3x - 9}$$

7. Evaluate this limit.

$$\lim_{x \to -2} \frac{-x^2 + x + 6}{x^2 - 2x - 8}$$

8. Evaluate this limit.

$$\lim_{x \to 16} \frac{16 - x}{4 - \sqrt{x}}$$

9. Evaluate this limit.

$$\lim_{x \to -4} \frac{8x + 32}{x^2 + 5x + 4}$$

10. Evaluate this limit.

$$\lim_{x \to -3} \frac{9x + 27}{x^2 + 5x + 6}$$

11. Evaluate this limit.

$$\lim_{x \to -3} \frac{x^2 + x - 6}{-4x^2 - 16x - 12}$$

12. Evaluate this limit.

$$\lim_{x \to 3} \frac{x^3 - 9x}{3x^2 - 6x - 9}$$

13. Evaluate this limit.

$$\lim_{x \to 25} \frac{5 - \sqrt{x}}{25 - x}$$

14. Evaluate this limit.

$$\lim_{x \to -2} \frac{2x^2 + 10x + 12}{x^2 + 3x + 2}$$

15. Evaluate this limit.

$$\lim_{x \to -3} \frac{x^2 + x - 6}{x^2 + 8x + 15}$$

16. Evaluate this limit.

$$\lim_{x \to -4} \frac{x^2 + 5x + 4}{x^2 + 9x + 20}$$

17. Evaluate this limit.

$$\lim_{x \to 5} \frac{2x^2 - 4x - 30}{3x^2 - 18x + 15}$$

18. Evaluate this limit.

$$\lim_{x \to 0} \frac{16x^3 + 80x^2}{40x^3 - 80x^2}$$

19. Evaluate this limit.

$$\lim_{x \to -4} \frac{x^3 + 64}{x + 4}$$

20. Evaluate this limit.

$$\lim_{x \to -1} \frac{x^3 + x^2 - 9x - 9}{x^3 + x^2 - 4x - 4}$$

Answers - Calculus 1 - Limits - Worksheet 4 – Evaluating Limits by Factoring, Part 2

1. Evaluate this limit.

$$\lim_{x\to 0}\frac{(4+x)^2-16}{x}$$

Solution:
First, attempt to evaluate the limit using direct substitution. Substitute 0 into the limit for x.

$$\lim_{x\to 0}\frac{(4+x)^2-16}{x}=\frac{(4+0)^2-16}{0}=\frac{16-16}{0}=\frac{0}{0}$$

The value of the limit is indeterminate using substitution. Now, multiply the numerator and simplify the limit.

$$\lim_{x\to 0}\frac{(4+x)^2-16}{x}=\lim_{x\to 0}\frac{16+8x+x^2-16}{x}$$

$$=\lim_{x\to 0}\frac{8x+x^2}{x}=\lim_{x\to 0}(8+x)$$

Substitute 0 into the limit for x.

$$\lim_{x\to 0}(8+x)=8+0=8$$

Answer: $\lim_{x\to 0}\frac{(4+x)^2-16}{x}=8$

2. Evaluate this limit.

$$\lim_{x \to 0} \frac{5x^3 + 8x^2}{3x^4 - 16x^2}$$

Solution:

First, attempt to evaluate the limit using direct substitution. Substitute 0 into the limit for x.

$$\lim_{x \to 0} \frac{5x^3 + 8x^2}{3x^4 - 16x^2} = \frac{5(0)^3 + 8(0)^2}{3(0)^4 - 16(0)^2} = \frac{0}{0}$$

The value of the limit is indeterminate using substitution. Now, factor and simplify the limit.

$$\lim_{x \to 0} \frac{5x^3 + 8x^2}{3x^4 - 16x^2} = \lim_{x \to 0} \frac{x^2(5x + 8)}{x^2(3x^2 - 16)} = \lim_{x \to 0} \frac{5x + 8}{(3x^2 - 16)}$$

Substitute 0 into the limit for x.

$$\lim_{x \to 0} \frac{5x + 8}{(3x^2 - 16)} = \frac{5(0) + 8}{(3(0)^2 - 16)} = \frac{8}{-16} = -\frac{1}{2}$$

Answer: $\lim_{x \to 0} \frac{5x^3+8x^2}{3x^4-16x^2} = -\frac{1}{2}$

---

3. Evaluate this limit.

$$\lim_{x \to 0} \frac{(2+x)^3 - 8}{x}$$

Solution:

First, attempt to evaluate the limit using direct substitution. Substitute 0 into the limit for x.

$$\lim_{x \to 0} \frac{(2+x)^3 - 8}{x} = \frac{(2+0)^3 - 8}{0} = \frac{8-8}{0} = \frac{0}{0}$$

The value of the limit is indeterminate using substitution. Now, multiply the numerator and simplify the limit.

$$\lim_{x \to 0} \frac{(2+x)^3 - 8}{x} = \lim_{x \to 0} \frac{x^3 + 6x^2 + 12x + 8 - 8}{x}$$

$$\lim_{x \to 0} \frac{x^3 + 6x^2 + 12x}{x} = \lim_{x \to 0} (x^2 + 6x + 12)$$

Substitute 0 into the limit for x.

$$\lim_{x \to 0} (x^2 + 6x + 12) = 0^2 + 6(0) + 12 = 12$$

Answer: $\lim_{x \to 0} \frac{(2+x)^3 - 8}{x} = 12$

4. Evaluate this limit.

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

Solution:
First, attempt to evaluate the limit using direct substitution. Substitute 1 into the limit for x.

$$\lim_{x \to 1} \frac{4x^3 - 2x^2 + x - 3}{x - 1} = \frac{4(1)^3 - 2(1)^2 + 1 - 3}{1 - 1} = \frac{0}{0}$$

The value of the limit is indeterminate using substitution. Now, factor and simplify the limit.

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

$$= \lim_{x \to 1}(4x^2 + 2x + 3)$$

Substitute 1 into the limit for x.

$$= \lim_{x \to 1}(4x^2 + 2x + 3) = 4(1)^2 + 2(1) + 3 = 9$$

Answer: $\lim_{x \to 1} \frac{4x^3 - 2x^2 + x - 3}{x - 1} = 9$

5. Evaluate this limit.

$$\lim_{x \to 4} \frac{2x^2 - 12x + 16}{x^2 - x - 12}$$

Solution:

First, attempt to evaluate the limit using direct substitution. Substitute 4 into the limit for x.

$$\lim_{x \to 4} \frac{2x^2 - 12x + 16}{x^2 - x - 12} = \frac{2(4)^2 - 12(4) + 16}{4^2 - 4 - 12} = \frac{0}{0}$$

The value of the limit is indeterminate using substitution. Now, factor and simplify the limit.

$$\lim_{x \to 4} \frac{2x^2 - 12x + 16}{x^2 - x - 12} = \lim_{x \to 4} \frac{2(x^2 - 6x + 8)}{x^2 - x - 12}$$

$$= \lim_{x \to 4} \frac{2(x-2)(x-4)}{(x-4)(x+3)} = \lim_{x \to 4} \frac{2(x-2)}{x+3}$$

Substitute 4 into the limit for x.

$$= \lim_{x \to 4} \frac{2(x-2)}{x+3} = \frac{2(4-2)}{4+3} = \frac{4}{7}$$

Answer: $\lim_{x \to 4} \frac{2x^2 - 12x + 16}{x^2 - x - 12} = \frac{4}{7}$

6. Evaluate this limit.

$$\lim_{x\to -3}\frac{x^2+2x-3}{-3x-9}$$

Solution:
First, attempt to evaluate the limit using direct substitution. Substitute -3 into the limit for x.

$$\lim_{x\to -3}\frac{x^2+2x-3}{-3x-9}=\frac{(-3)^2+2(-3)-3}{-3(-3)-9}=\frac{0}{0}$$

The value of the limit is indeterminate using substitution. Now, factor and simplify the limit.

$$\lim_{x\to -3}\frac{x^2+2x-3}{-3x-9}=\lim_{x\to -3}\frac{(x+3)(x-1)}{-3(x+3)}=\lim_{x\to -3}\frac{x-1}{-3}$$

Substitute -3 into the limit for x.

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

Answer: $\lim_{x\to -3}\frac{x^2+2x-3}{-3x-9}=\frac{4}{3}$

---

7. Evaluate this limit.

$$\lim_{x \to -2} \frac{-x^2 + x + 6}{x^2 - 2x - 8}$$

Solution:

First, attempt to evaluate the limit using direct substitution. Substitute -2 into the limit for x.

$$\lim_{x \to -2} \frac{-x^2 + x + 6}{x^2 - 2x - 8} = \frac{-(-2)^2 + (-2) + 6}{(-2)^2 - 2(-2) - 8} = \frac{0}{0}$$

The value of the limit is indeterminate using substitution. Now, factor and simplify the limit.

$$\lim_{x \to -2} \frac{-x^2 + x + 6}{x^2 - 2x - 8} = \lim_{x \to -2} \frac{-(x^2 - x - 6)}{x^2 - 2x - 8}$$

$$= \lim_{x \to -2} \frac{-(x-3)(x+2)}{(x-4)(x+2)} = \lim_{x \to -2} \frac{-(x-3)}{x-4}$$

Substitute -2 into the limit for x.

$$\lim_{x \to -2} \frac{-(x-3)}{x-4} = \frac{-(-2-3)}{-2-4} = \frac{5}{-6} = -\frac{5}{6}$$

Answer: $\lim_{x \to -2} \frac{-x^2+x+6}{x^2-2x-8} = -\frac{5}{6}$

8. Evaluate this limit.

$$\lim_{x \to 16} \frac{16 - x}{4 - \sqrt{x}}$$

Solution:

First, attempt to evaluate the limit using direct substitution. Substitute 16 into the limit for x.

$$\lim_{x \to 16} \frac{16 - x}{4 - \sqrt{x}} = \frac{16 - 16}{4 - \sqrt{16}} = \frac{16 - 16}{4 - 4} = \frac{0}{0}$$

The value of the limit is indeterminate using substitution. Now, rationalize the denominator and simplify the limit.

$$\lim_{x \to 16} \frac{16 - x}{4 - \sqrt{x}} = \lim_{x \to 16} \frac{(16 - x)}{(4 - \sqrt{x})} \cdot \frac{(4 + \sqrt{x})}{(4 + \sqrt{x})}$$

$$= \lim_{x \to 16} \frac{(16 - x)(4 + \sqrt{x})}{16 - x} = \lim_{x \to 16} (4 + \sqrt{x})$$

Substitute 16 into the limit for x.

$$\lim_{x \to 16} \left(4 + \sqrt{x}\right) = 4 + \sqrt{16} = 4 + 4 = 8$$

Answer: $\lim_{x \to 16} \frac{16-x}{4-\sqrt{x}} = 8$

---

9. Evaluate this limit.

$$\lim_{x \to -4} \frac{8x + 32}{x^2 + 5x + 4}$$

Solution:

First, attempt to evaluate the limit using direct substitution. Substitute -4 into the limit for x.

$$\lim_{x \to -4} \frac{8x + 32}{x^2 + 5x + 4} = \frac{8(-4) + 32}{(-4)^2 + 5(-4) + 4} = \frac{0}{0}$$

The value of the limit is indeterminate using substitution. Now, factor and simplify the limit.

$$\lim_{x \to -4} \frac{8x + 32}{x^2 + 5x + 4} = \lim_{x \to -4} \frac{8(x + 4)}{(x + 1)(x + 4)} = \lim_{x \to -4} \frac{8}{x + 1}$$

Substitute -4 into the limit for x.

$$\lim_{x \to -4} \frac{8}{x + 1} = \frac{8}{-4 + 1} = \frac{8}{-3} = -\frac{8}{3}$$

Answer: $\lim_{x \to -4} \frac{8x+32}{x^2+5x+4} = -\frac{8}{3}$

---

10. Evaluate this limit.

$$\lim_{x \to -3} \frac{9x + 27}{x^2 + 5x + 6}$$

Solution:

First, attempt to evaluate the limit using direct substitution. Substitute -3 into the limit for x.

$$\lim_{x \to -3} \frac{9x + 27}{x^2 + 5x + 6} = \frac{9(-3) + 27}{(-3)^2 + 5(-3) + 6} = \frac{0}{0}$$

The value of the limit is indeterminate using substitution. Now, factor and simplify the limit.

$$\lim_{x \to -3} \frac{9x + 27}{x^2 + 5x + 6} = \lim_{x \to -3} \frac{9(x + 3)}{(x + 3)(x + 2)} = \lim_{x \to -3} \frac{9}{x + 2}$$

Substitute -3 into the limit for x.

$$\lim_{x \to -3} \frac{9}{x + 2} = \frac{9}{-3 + 2} = \frac{9}{-1} = -9$$

Answer: $\lim_{x \to -3} \frac{9x+27}{x^2+5x+6} = -9$

11. Evaluate this limit.

$$\lim_{x \to -3} \frac{x^2 + x - 6}{-4x^2 - 16x - 12}$$

Solution:
First, attempt to evaluate the limit using direct substitution. Substitute -3 into the limit for x.

$$\lim_{x \to -3} \frac{x^2 + x - 6}{-4x^2 - 16x - 12} = \frac{(-3)^2 + (-3) - 6}{-4(-3)^2 - 16(-3) - 12} = \frac{0}{0}$$

The value of the limit is indeterminate using substitution. Now, factor and simplify the limit.

$$\lim_{x \to -3} \frac{x^2 + x - 6}{-4x^2 - 16x - 12} = \lim_{x \to -3} \frac{(x+3)(x-2)}{-4(x^2 + 4x + 3)}$$

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

Substitute -3 into the limit for x.

$$= \lim_{x \to -3} \frac{x-2}{-4(x+1)} = \frac{-3-2}{-4(-3+1)} = -\frac{5}{8}$$

Answer: $\lim_{x \to -3} \frac{x^2+x-6}{-4x^2-16x-12} = -\frac{5}{8}$

12. Evaluate this limit.

$$\lim_{x \to 3} \frac{x^3 - 9x}{3x^2 - 6x - 9}$$

Solution:

First, attempt to evaluate the limit using direct substitution. Substitute 3 into the limit for x.

$$\lim_{x \to 3} \frac{x^3 - 9x}{3x^2 - 6x - 9} = \frac{3^3 - 9(3)}{3(3)^2 - 6(3) - 9} = \frac{0}{0}$$

The value of the limit is indeterminate using substitution. Now, factor and simplify the limit.

$$\lim_{x \to 3} \frac{x^3 - 9x}{3x^2 - 6x - 9} = \lim_{x \to 3} \frac{x(x^2 - 9)}{3(x^2 - 2x - 3)}$$

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

Substitute 3 into the limit for x.

$$\lim_{x \to 3} \frac{x(x+3)}{3(x+1)} = \frac{3(3+3)}{3(3+1)} = \frac{18}{12} = \frac{3}{2}$$

Answer: $\lim_{x \to 3} \frac{x^3 - 9x}{3x^2 - 6x - 9} = \frac{3}{2}$

---

13. Evaluate this limit.

$$\lim_{x \to 25} \frac{5 - \sqrt{x}}{25 - x}$$

Solution:

First, attempt to evaluate the limit using direct substitution. Substitute 25 into the limit for x.

$$\lim_{x \to 25} \frac{5 - \sqrt{x}}{25 - x} = \frac{5 - \sqrt{25}}{25 - 25} = \frac{5 - 5}{25 - 25} = \frac{0}{0}$$

The value of the limit is indeterminate using substitution. Now, rationalize the numerator and simplify the limit.

$$\lim_{x \to 25} \frac{5 - \sqrt{x}}{25 - x} = \lim_{x \to 25} \frac{5 - \sqrt{x}}{25 - x} \cdot \frac{5 + \sqrt{x}}{5 + \sqrt{x}}$$

$$= \lim_{x \to 25} \frac{25 - x}{(25 - x)(5 + \sqrt{x})} = \lim_{x \to 25} \frac{1}{5 + \sqrt{x}}$$

Substitute 25 into the limit for x.

$$\lim_{x \to 25} \frac{1}{5 + \sqrt{x}} = \frac{1}{5 + \sqrt{25}} = \frac{1}{5 + 5} = \frac{1}{10}$$

Answer: $\lim_{x \to 25} \frac{5 - \sqrt{x}}{25 - x} = \frac{1}{10}$

14. Evaluate this limit.

$$\lim_{x \to -2} \frac{2x^2 + 10x + 12}{x^2 + 3x + 2}$$

Solution:

First, attempt to evaluate the limit using direct substitution. Substitute -2 into the limit for x.

$$\lim_{x \to -2} \frac{2x^2 + 10x + 12}{x^2 + 3x + 2} = \frac{2(-2)^2 + 10(-2) + 12}{(-2)^2 + 3(-2) + 2} = \frac{0}{0}$$

The value of the limit is indeterminate using substitution. Now, factor and simplify the limit.

$$\lim_{x \to -2} \frac{2x^2 + 10x + 12}{x^2 + 3x + 2} = \lim_{x \to -2} \frac{2(x^2 + 5x + 6)}{x^2 + 3x + 2}$$

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

Substitute -2 into the limit for x.

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

Answer: $\lim_{x \to -2} \frac{2x^2+10x+12}{x^2+3x+2} = -2$

15. Evaluate this limit.

$$\lim_{x\to -3}\frac{x^2+x-6}{x^2+8x+15}$$

Solution:

First, attempt to evaluate the limit using direct substitution. Substitute -3 into the limit for x.

$$\lim_{x\to -3}\frac{x^2+x-6}{x^2+8x+15}=\frac{(-3)^2+(-3)-6}{(-3)^2+8(-3)+15}=\frac{0}{0}$$

The value of the limit is indeterminate using substitution. Now, factor and simplify the limit.

$$\lim_{x\to -3}\frac{x^2+x-6}{x^2+8x+15}=\lim_{x\to -3}\frac{(x+3)(x-2)}{(x+3)(x+5)}=\lim_{x\to -3}\frac{x-2}{x+5}$$

Substitute -3 into the limit for x.

$$\lim_{x\to -3}\frac{x-2}{x+5}=\frac{-3-2}{-3+5}=-\frac{5}{2}$$

Answer: $\lim_{x\to -3}\frac{x^2+x-6}{x^2+8x+15}=-\frac{5}{2}$

---

16. Evaluate this limit.

$$\lim_{x \to -4} \frac{x^2 + 5x + 4}{x^2 + 9x + 20}$$

Solution:
First, attempt to evaluate the limit using direct substitution. Substitute -4 into the limit for x.

$$\lim_{x \to -4} \frac{x^2 + 5x + 4}{x^2 + 9x + 20} = \frac{(-4)^2 + 5(-4) + 4}{(-4)^2 + 9(-4) + 20} = \frac{0}{0}$$

The value of the limit is indeterminate using substitution. Now, factor and simplify the limit.

$$\lim_{x \to -4} \frac{x^2 + 5x + 4}{x^2 + 9x + 20} = \lim_{x \to -4} \frac{(x+4)(x+1)}{(x+5)(x+4)} = \lim_{x \to -4} \frac{x+1}{x+5}$$

Substitute -4 into the limit for x.

$$\lim_{x \to -4} \frac{x+1}{x+5} = \frac{-4+1}{-4+5} = -3$$

Answer: $\lim_{x \to -4} \frac{x^2+5x+4}{x^2+9x+20} = -3$

17. Evaluate this limit.

$$\lim_{x \to 5} \frac{2x^2 - 4x - 30}{3x^2 - 18x + 15}$$

First, attempt to evaluate the limit using direct substitution. Substitute 5 into the limit for x.

$$\lim_{x \to 5} \frac{2x^2 - 4x - 30}{3x^2 - 18x + 15} = \frac{2(5)^2 - 4(5) - 30}{3(5)^2 - 18(5) + 15} = \frac{0}{0}$$

The value of the limit is indeterminate using substitution. Now, factor and simplify the limit.

$$\lim_{x \to 5} \frac{2x^2 - 4x - 30}{3x^2 - 18x + 15} = \lim_{x \to 5} \frac{2(x^2 - 2x - 15)}{3(x^2 - 6x + 5)}$$

$$= \lim_{x \to 5} \frac{2(x - 5)(x + 3)}{3(x - 5)(x - 1)} = \lim_{x \to 5} \frac{2(x + 3)}{3(x - 1)}$$

Substitute 5 into the limit for x.

$$= \lim_{x \to 5} \frac{2(x + 3)}{3(x - 1)} = \frac{2(5 + 3)}{3(5 - 1)} = \frac{2(8)}{3(4)} = \frac{4}{3}$$

Answer: $\lim_{x \to 5} \frac{2x^2 - 4x - 30}{3x^2 - 18x + 15} = \frac{4}{3}$

18. Evaluate this limit.

$$\lim_{x\to 0}\frac{16x^3+80x^2}{40x^3-80x^2}$$

Solution:
First, attempt to evaluate the limit using direct substitution. Substitute 0 into the limit for x.

$$\lim_{x\to 0}\frac{16x^3+80x^2}{40x^3-80x^2}=\frac{16(0)^3+80(0)^2}{40(0)^3-80(0)^2}=\frac{0}{0}$$

The value of the limit is indeterminate using substitution. Now, factor and simplify the limit.

$$\lim_{x\to 0}\frac{16x^3+80x^2}{40x^3-80x^2}=\lim_{x\to 0}\frac{16x^2(x+5)}{40x^2(x-2)}=\lim_{x\to 0}\frac{2(x+5)}{5(x-2)}$$

Substitute 0 into the limit for x.

$$\lim_{x\to 0}\frac{2(x+5)}{5(x-2)}=\frac{2(0+5)}{5(0-2)}=\frac{10}{-10}=-1$$

Answer: $\lim_{x\to 0}\frac{16x^3+80x^2}{40x^3-80x^2}=-1$

19. Evaluate this limit.

$$\lim_{x \to -4} \frac{x^3 + 64}{x + 4}$$

Solution:
First, attempt to evaluate the limit using direct substitution. Substitute -4 into the limit for x.

$$\lim_{x \to -4} \frac{x^3 + 64}{x + 4} = \frac{(-4)^3 + 64}{-4 + 4} = \frac{0}{0}$$

The value of the limit is indeterminate using substitution. Now, factor and simplify the limit.

$$\lim_{x \to -4} \frac{x^3 + 64}{x + 4} = \lim_{x \to -4} \frac{(x + 4)(x^2 - 4x + 16)}{x + 4} = \lim_{x \to -4} (x^2 - 4x + 16)$$

Substitute -4 into the limit for x.

$$\lim_{x \to -4} (x^2 - 4x + 16) = (-4)^2 - 4(-4) + 16 = 48$$

Answer: $\lim_{x \to -4} \frac{x^3+64}{x+4} = 48$

20. Evaluate this limit.

$$\lim_{x\to -1}\frac{x^3+x^2-9x-9}{x^3+x^2-4x-4}$$

Solution:
First, attempt to evaluate the limit using direct substitution. Substitute -1 into the limit for x.

$$\lim_{x\to -1}\frac{x^3+x^2-9x-9}{x^3+x^2-4x-4}=\frac{(-1)^3+(-1)^2-9(-1)-9}{(-1)^3+(-1)^2-4(-1)-4}=\frac{0}{0}$$

The value of the limit is indeterminate using substitution. Now, factor and simplify the limit.

$$\lim_{x\to -1}\frac{x^3+x^2-9x-9}{x^3+x^2-4x-4}=\lim_{x\to -1}\frac{(x+1)(x^2-9)}{(x+1)(x^2-4)}$$

$$=\lim_{x\to -1}\frac{x^2-9}{x^2-4}$$

Substitute -1 into the limit for x.

$$\lim_{x\to -1}\frac{x^2-9}{x^2-4}=\frac{(-1)^2-9}{(-1)^2-4}=\frac{1-9}{1-4}=\frac{-8}{-3}=\frac{8}{3}$$

Answer: $\lim_{x\to -1}\frac{x^3+x^2-9x-9}{x^3+x^2-4x-4}=\frac{8}{3}$