

What are $\frac{0}{0}$ and $\frac{\infty}{\infty}$?

Answer: M.W. = MORE WORK The problem is NOT DONE .

The more work is often **Algebra!**

These expressions mean More Work.

| | | |
|-------------------|-------------------------|------------------|
| $\frac{0}{0}$ | $\frac{\infty}{\infty}$ | $0 \cdot \infty$ |
| $\infty - \infty$ | $0 \cdot \infty$ | 0^∞ |

You should know the following ($\#$ denotes a non-zero number)

When you Plug-in and get these - you are done.

| | | |
|----------------------------|---------------------------------|--------------------------------|
| a) $\frac{0}{\#} = 0$ | b) $\frac{\#}{0} = \infty$ | c) $\frac{0}{\infty} = 0$ |
| d) $\frac{\#}{\infty} = 0$ | e) $\frac{\infty}{\#} = \infty$ | f) $\frac{\infty}{0} = \infty$ |

You should think of ∞ As A Number. It is a legitimate answer.

Handout - Evaluating at 0 and ∞

Evaluate the following at both $x = 0$ and $x = \infty$

a) $\frac{3X^7 + 9X^6}{8X^7 - 15X^6}$

b) $\frac{5X^6 + 11X^5}{6X^6 - 9X^5}$

c) $\frac{10X^7 - 7X^8}{2X^8 - 11X^7}$

d) $\frac{2X^3 + 14X^2}{2X^3 - 14X^2}$

Evaluate the following at $x = 0$

a) $\frac{7x^9 + 2x^7}{11x^{10} - 8x^9 + 7x^2}$

b) $\frac{9x^7 + 2x^6}{15x^9 + 5x^7 + 7x}$

c) $\frac{9x^5 + 10x^2}{3x^{11} + 5x^9 + 7x^6}$

d) $\frac{9x^5 + 14x^3}{3x^9 + 7x^7 + 3x^6}$

e) $(11x + 7) \cdot (17x + 10) - 70$

f) $(11x + 3) \cdot (20x + 4) - 12$

g) $\frac{13x}{1 - \sqrt{8x + 1}}$

h) $\frac{11x}{4 - \sqrt{10x + 16}}$

Answers a) $\frac{3}{8}, -\frac{3}{5}$; b) $\frac{5}{6}, -\frac{11}{9}$; c) $-\frac{7}{2}, -\frac{10}{11}$; d) $1, -1$;

Answers a) 0; b) 0; c) ∞ ; d) ∞ ; e) 0; f) 0; g) $-\frac{13}{4}$; h) $-\frac{44}{5}$;

Evaluate the following at $x = \infty$

a) $\frac{3x^7 + 9x^2 - 15}{12 - 6x^2}$

b) $\frac{2x^5 + 2x^4 - 13}{11 - 6x^3}$

c) $\left(14x + \frac{23}{x}\right)^2 - \left(14x - \frac{23}{x}\right)^2$

d) $\left(9x + \frac{15}{x}\right)^2 - \left(9x - \frac{15}{x}\right)^2$

e) $\sqrt{17x + 339} - \sqrt{17x + 59}$

f) $\sqrt{11x + 379} - \sqrt{11x + 57}$

Evaluate the following at $x = 0$

a) $\frac{7 - \sqrt{12x + 49}}{8x}$

b) $\frac{2 - \sqrt{10x + 4}}{4x}$

c) $\frac{2}{x} \cdot \left(\frac{12}{x + 19} - \frac{12}{19}\right)$

d) $\frac{4}{x} \cdot \left(\frac{12}{x + 19} - \frac{12}{19}\right)$

Answers a) ∞ ; b) $-\infty$; c) 1288; d) 540; e) 0; f) 0;

Answers a) $-\frac{3}{28}$; b) $-\frac{5}{8}$; c) $-\frac{24}{361}$; d) $-\frac{48}{361}$;

Evaluate the *Difference Quotient* at $h = 0$ for the given function $f(x)$.

$$\frac{f(x+h) - f(x)}{h}$$

a) $f(x) = x^2 - 6x - 14$

b) $f(x) = x^2 - 2x - 17$

c) $f(x) = 5x^2 + 2x + 8$

d) $f(x) = 5x^2 + 2x + 19$

e) $f(x) = x^3 + 5x^2$

f) $f(x) = x^3 + 4x^2$

g) $f(x) = 6x^3 + 2x^2$

h) $f(x) = \frac{1}{x-5}$

Answers a) $2x - 6$; b) $2x - 2$; c) $10x + 2$; d) $10x + 2$; e) $3x^2 + 10x$; f) $3x^2 + 8x$; g) $18x^2 + 4x$; h)
 $-\frac{1}{(x-5)^2}$

1a. Evaluate the expression at $X = \infty$: $\frac{15X^4 - 2X^5}{3X^5 - 10X^4}$

1b. Evaluate the expression at $X = 0$: $\frac{15X^4 - 2X^5}{3X^5 - 10X^4}$

2. Evaluate the expression at $x = \infty$: $\frac{4x^4 + 2x^3 + 11}{15 - 5x^3}$

3. Evaluate the expression at $x = 0$: $\frac{9x^8 + 2x^7}{14x^9 + 7x^8 + 8x^4}$

4. Evaluate the expression at $x = 0$: $\frac{8x^2 + 13x}{4x^9 + 6x^8 + 4x^5}$

5. Evaluate the expression at $x = \infty$: $\left(9x + \frac{20}{x}\right)^2 - \left(9x - \frac{20}{x}\right)^2$

6. Evaluate the expression at $x = 0$: $\frac{12x}{5 - \sqrt{9x + 25}}$

7. Evaluate the Difference Quotient $\frac{f(x+h) - f(x)}{h}$ at $h = 0$ for $f(x) = 7x^2 + 4x + 3$

Answers: 1) a) $-\frac{2}{3}$ b) $-\frac{3}{2}$ 2) $-\infty$ 3) 0 4) ∞ 5) 720 6) $-\frac{40}{3}$ 7) $14x + 4$

**Show all work - Circle Answers**

1a. Evaluate the expression at $X = \infty$: $\frac{10X^4 - 6X^8}{6X^8 + 15X^4}$

1b. Evaluate the expression at $X = 0$: $\frac{10X^4 - 6X^8}{6X^8 + 15X^4}$

2. Evaluate the expression at $x = \infty$: $\frac{8x^4 + 5x^2 + 14}{12 - 6x}$

3. Evaluate the expression at $x = 0$: $\frac{9x^5 + 2x^3}{11x^6 + 5x^5 + 4x^2}$

4. Evaluate the expression at $x = 0$: $\frac{3x^3 + 10x}{2x^9 + 6x^7 + 4x^4}$

5. Evaluate the expression at $x = \infty$: $\left(14x + \frac{17}{x}\right)^2 - \left(14x - \frac{17}{x}\right)^2$

6. Evaluate the expression at $x = 0$: $\frac{12x}{5 - \sqrt{10x + 25}}$

7. Evaluate the Difference Quotient $\frac{f(x+h) - f(x)}{h}$ at $h = 0$ for $f(x) = 2x^2 + 6x - 15$

Answers: 1) a) -1 b) $\frac{2}{3}$ 2) $-\infty$ 3) 0 4) ∞ 5) 952 6) -12 7) $4x + 6$