Limits

1. $\lim_{x\to 0} 2+x = \boxed{2}$
2. $\lim_{x\to 0} 2+3x = \boxed{2}$
3. $\lim_{x\to 0} \frac{2x}{3x} = \boxed{2/3}$
4. $\lim_{x\to \infty} \frac{1}{x} = \boxed{0}$
5. $\lim_{x\to \infty} 2+\frac{3}{x} = \boxed{2}$
6. $\lim_{x\to 0} \frac{2x+x^2}{3x-6x^2} = \boxed{2/3}$
7. $\lim_{x\to 1} \frac{x-1}{(x-1)(x+1)} = \boxed{1/2}$

Logs

8. $\log_2(4) = \boxed{2}$
9. $\log_2(8) = \boxed{3}$
10. $\log_2(16) = \boxed{4}$
11. $\log_2(2) = \boxed{1}$
12. $\log_2(\frac{1}{2}) = \boxed{\text{-1}}$
13. $\log_3(9) = \boxed{2}$
14. $\log_3(81) = \boxed{4}$
15. $\log_3(\frac{1}{27}) = \boxed{\text{-3}}$
16. $\log_4(16) = \boxed{2}$
17. $\log_4(64) = \boxed{3}$
18. $\log_5(25) = \boxed{2}$
19. $\log_5(125) = \boxed{3}$
20. $\log_{10}(100) = \boxed{2}$
21. $\log_{10}(\frac{1}{10}) = \boxed{\text{-1}}$
22. $\log_{10}(.1) = \boxed{\text{-1}}$
23. $\log_{10}(.001) = \boxed{\text{-3}}$
24. $\log_{10}(1,000,000) = \boxed{6}$

Fractional/Negative Exponents

1. $9^{\frac{1}{2}} =$ 3
2. $9^{-1} =$ $\frac{1}{9}$
3. $9^{-\frac{1}{2}} =$ $\frac{1}{\sqrt{9}} = \frac{1}{3}$
4. $8^{\frac{1}{3}} =$ 2
5. $8^{-\frac{1}{3}} =$ $\frac{1}{2}$
6. $8^{\frac{4}{3}} =$ 16
7. $8^{-\frac{2}{3}} =$ $\frac{1}{4}$
8. $64^{\frac{1}{2}} =$ 8
9. $64^{\frac{1}{3}} =$ 4
10. $64^{\frac{2}{3}} =$ 16

Fractions and Reciprocals

60 works well!

1. $\left(10^{-1} + 15^{-1} + 6^{-1}\right)^{-1} = \left(\frac{1}{10} + \frac{1}{15} + \frac{1}{6}\right)^{-1}$
$= \left(\frac{6}{60} + \frac{4}{60} + \frac{10}{60}\right)^{-1}$
$= \left(\frac{20}{60}\right)^{-1} = \left(\frac{1}{3}\right)^{-1} = \frac{3}{1} = \boxed{3}$

2. $\left(12^{-1} - 24^{-1} + 36^{-1}\right)^{-1} = \left(\frac{1}{12} - \frac{1}{24} + \frac{1}{36}\right)^{-1}$ 6·12 works well
($1\cdot 12$, $2\cdot 12$, $3\cdot 12$)
$= \left(\frac{6}{6\cdot 12} - \frac{3}{6\cdot 12} + \frac{2}{6\cdot 12}\right)^{-1} = \left(\frac{5}{6\cdot 12}\right)^{-1}$
$= \frac{6\cdot 12}{5} = \boxed{\frac{72}{5}}$

Decimals

Write each the following as a decimal, then write its equivalent value as a percent.

1. $\frac{1}{10} + \frac{2}{100} + \frac{3}{1000} =$ $.1 + .02 + .003 = .123 = 12.3\%$

2. $\frac{1}{5} + \frac{1}{20} + \frac{3}{500} =$ $\frac{2}{10} + \frac{5}{100} + \frac{6}{1000} = .256 = 25.6\%$

3. $\frac{3}{4} - \frac{1}{5} + \frac{1}{200} =$ $\frac{75}{100} - \frac{20}{100} + \frac{5}{1000} = \frac{55}{100} + \frac{5}{1000} = .55 + .005$
$= .555 = 55.5\%$

4. $\frac{4}{100} + \frac{5}{10{,}000} + \frac{6}{1{,}000{,}000} =$ $.04 + .0005 + .000006$
$= .040506 = 4.0506\%$

5. $\frac{4}{10} - \frac{5}{100} + \frac{6}{1{,}000} =$ $.4 - .05 + .006 = .35 + .006 = .356 = 35.6\%$

Distributing

Multiply out the following

1. $(a+b)(c+d)(e+f) =$ $a(c+d)(e+f) + b(c+d)(e+f)$
$= ac(e+f) + ad(e+f) + bc(e+f) + bd(e+f)$
$= ace + acf + ade + adf + bce + bcf + bde + bdf$

2. $(a-b)(c-d)(e-f) =$
$ace - acf - ade + adf - bce + bcf + bde - bdf$

3. $(x+2)(x-5) =$ $x^2 - 3x - 10$

4. $(a+b+c)(d+e+f) =$ $ad + ae + af + bd + be + bf + cd + ce + cf$

5. $(k+c)(k^4 - k^3c + k^2c^2 - kc^3) =$ $k^5 - c^5$ (+c^4 ×) This was a typo. sorry!

6. $(4xy^2k^{-2} + 3x^{-1})(xk^3 - yk) =$ $4xy^2k^{-2} \cdot xk^3 - 4xy^2k^{-2} \cdot yk$
$+ 3x^{-1} \cdot xk^3 - 3x^{-1} \cdot yk$
$= 4x^2y^2k - 4xy^3k^{-1}$
$+ 3k^3 - 3x^{-1}yk$

Factoring

Factor the following polynomials

1. $x^3 - 1 =$ $(x-1)(x^2+x+1)$
2. $x^3 + y^3 =$ $(x+y)(x^2-xy+y^2)$
3. $x^2 + 15x + 50 =$ $(x+5)(x+10)$
4. $x^2 - 15x + 50 =$ $(x-5)(x-10)$
5. $x^2 + 5x - 50 =$ $(x+10)(x-5)$
6. $x^2 - 5x - 50 =$ $(x-10)(x+5)$
7. $12x^2 - 7x + 1 =$ $(3x-1)(4x-1)$

$(-3)(-4)$ $-3+-4$

Canceling Linear Factors

Simplify the following rational functions. They should all end up as polynomials.

1. $\frac{x^2-1}{x-1} =$ $\frac{(x-1)(x+1)}{(x-1)} = x+1$
2. $\frac{x^3-8}{x-2} =$ $\frac{(x-2)(x^2+2x+4)}{(x-2)} = x^2+2x+4$
3. $\frac{3x^2+6x+3}{x+2} = \frac{3(x^2+2x+1)}{x+1} = \frac{3(x+1)^2}{x+1} = 3(x+1) = 3x+3$

this should have been a 1, sorry!

Fractional/Negative Exponents (Algebra)

For each expression, simplify and write the result as a fraction using only positive exponents. #3 is a challenge.

1. $\frac{12a^{-2}b^3c^{-4}}{16a^{-3}b^{-1}c^3} = \frac{3ab^4}{4c^7}$

2. $\frac{10kxy-4k^{-1}x^2y}{6k^{-2}x^{-2}y^{-2}+12kxy} = \frac{10k^3x^3y^3-4kx^4y^3}{6+12k^3x^3y^3}$

$\frac{x^2y^2k^2}{x^2y^2k^2}$

3. $\left((a^{12}b^6)^{-\frac{1}{2}}\right)^{-\frac{1}{3}} = \left(\frac{1}{\sqrt{a^{12}b^6}}\right)^{-\frac{1}{3}} = \left(\frac{1}{a^6b^3}\right)^{-\frac{1}{3}} = \sqrt[3]{a^6b^3} = a^2b$