$\lim_{x\to c}[f(x)]^n = [\lim_{x\to c} f(x)]^n$

$\lim_{x\to 0}\sqrt{5x^2+8} = \sqrt{\lim_{x\to 0}(5x^2+8)}$

$\lim_{x\to 1}(3x-5)^4 = [\lim_{x\to 1}(3x-5)]^4 = (-2)^4 = 16$

LIMIT OF A QUOTIENT

$$\lim_{x\to c}\left[\frac{f(x)}{g(x)}\right] = \frac{[\lim_{x\to c} f(x)]}{[\lim_{x\to c} g(x)]}$$

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

$\frac{5(1)^3-1+2}{3(1)+4} = \boxed{\frac{6}{7}}$

PRACTICE: Factor and simplify if possible, before "plugging in".

1. $\lim_{x\to -1}(5x^3-x+3)^{4/3} = \sqrt[3]{(5(-1)^3-(-1)+3)^4} = \sqrt[3]{(-1)^4} = \sqrt[3]{1} = \boxed{1}$

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

$x\neq 3$ HOLE at $x=3$

NOTICE $(3)^2-9=0$ NEED TO FACTOR

$x\neq 2$ HOLE at $x=2$

$\lim_{x\to 2}\frac{(x^3-2x^2)+(4x-8)}{(x^4-2x)+(x-2)} = \frac{x^2(x-2)+2(x-2)}{x^3(x-2)+1(x-2)} = \frac{\cancel{(x-2)}(x^2+2)}{\cancel{(x-2)}(x^3+1)} = \frac{2^2+2}{2^3+1} = \frac{6}{9} = \boxed{\frac{2}{3}}$

NOTICE $(2)^4-2(2)^3+2\cdot 2=0$ NEED TO FACTOR

HW14.2: Find limits algebraically. Factor and simplify, if possible, before "Plugging in". Show work on separate paper.

1. $\lim_{x\to 1} 5 = 5$ ($y=5$)
2. $\lim_{x\to 1}(-3)$
3. $\lim_{x\to 4} x = 4$ ($y=x$)
4. $\lim_{x\to -3} x$
5. $\lim_{x\to 2}(3x+2) = 8$
6. $\lim_{x\to 3}(2-5x)$
7. $\lim_{x\to -1}(3x^2-5x) = 3+5 = \boxed{8}$
8. $\lim_{x\to 2}(8x^2-4)$
9. $\lim_{x\to 1}(5x^4-3x^2+6x-9) = 5-3+6-9 = -1$
10. $\lim_{x\to -1}(8x^5-7x^3+8x^2+x-4)$
11. $\lim_{x\to 1}(x^2+1)^3 = 2^3 = 8$
12. $\lim_{x\to 2}(3x-4)^2$
13. $\lim_{x\to 1}\sqrt{5x+4} = \sqrt{9} = 3$
14. $\lim_{x\to 0}\sqrt{1-2x}$
15. $\lim_{x\to 0}\frac{x^2-4}{x^2+4} = \frac{-4}{4} = -1$
16. $\lim_{x\to 2}\frac{3x+4}{x^2+x}$
17. $\lim_{x\to 2}(3x-2)^{5/2} = (\sqrt{4})^5 = 2^5 = \boxed{32}$
18. $\lim_{x\to -1}(2x+1)^{5/3}$
19. $\lim_{x\to 2}\frac{x^2-4}{x^2-2x} = \frac{\cancel{(x-2)}(x+2)}{x\cancel{(x-2)}} = \frac{4}{2} = \boxed{2}$ ($x\neq 2$)
20. $\lim_{x\to -1}\frac{x^2+x}{x^2-1}$
21. $\lim_{x\to -3}\frac{x^2-x-12}{x^2-9} = \frac{(x-4)\cancel{(x+3)}}{(x-3)\cancel{(x+3)}} = \frac{-7}{-3} = \frac{7}{3}$
22. $\lim_{x\to -3}\frac{x^2+x-6}{x^2+2x-3}$
23. $\lim_{x\to 1}\frac{x^3-1}{x-1}$
24. $\lim_{x\to 1}\frac{x^4-1}{x-1}$
25. $\lim_{x\to -1}\frac{(x+1)^2}{x^2-1}$
26. $\lim_{x\to 2}\frac{x^3-8}{x^2-4}$
27. $\lim_{x\to 1}\frac{(x^3-x^2)+(x-1)}{(x^4-x^3)+(2x-2)}$
28. $\lim_{x\to -1}\frac{x^3+x^2+3x+3}{x^4+x^3+2x+2}$
29. $\lim_{x\to 2}\frac{x^3-2x^2+4x-8}{x^2+x-6}$

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

x^2+x+1

x^3+0x^2+0x-1

x^3-x^2

x^2+0x

x^2-x

$1x-1$

$-(x-1)$

25. $\lim_{x\to -1} = \frac{(x+1)\cancel{(x+1)}}{(x-1)\cancel{(x+1)}} = \frac{(-1+1)}{-2} = \boxed{0}$

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

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

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

$\frac{(1)^2+1}{(1)^3+}$

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

$\lim \frac{(x^2+4)\cancel{(x-2)}}{} = \frac{8}{}$