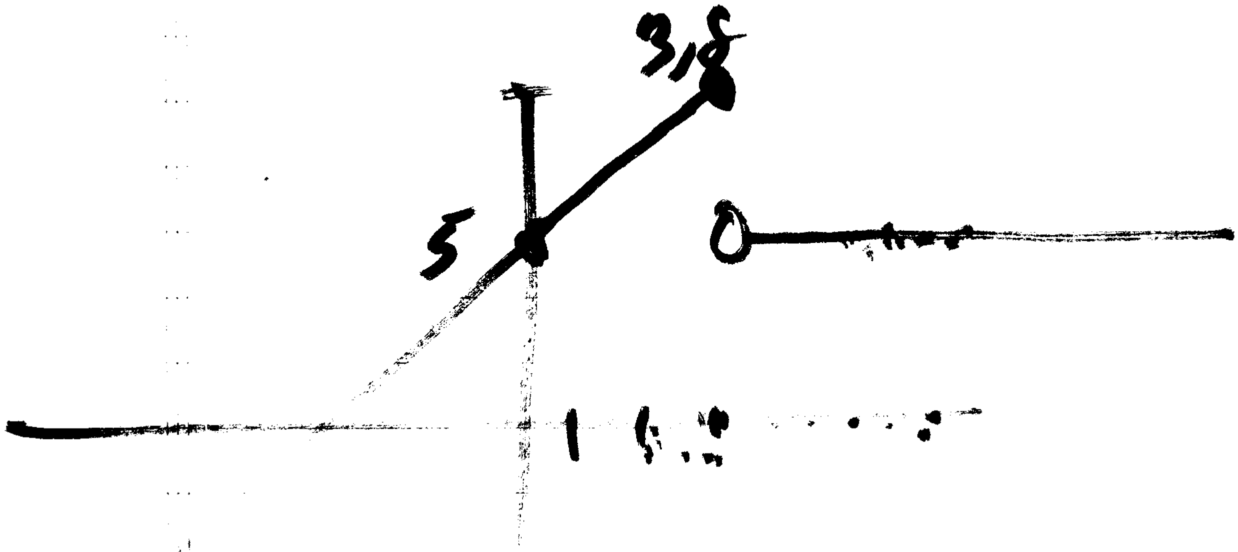
9/14

6. $f(x) = x+5 \quad x \le 3$

$f(x) = 5 \quad x > 3$



$\lim_{x \to 3^-} f(x) = 8$

$\lim_{x \to 3^+} f(x) = 5$

$\lim_{x \to 3} f(x) = DNE$

$f(t) = t^2 - c \quad (-\infty, 2)$

$f(t) = ct + 5 \quad [2, \infty$

Match at $t = 2$

$$\lim_{t \to 2^-} f(t) = 2^2 - c = 4 - c$$

$$\lim_{t \to 2^+} f(t) = c \cdot 2 + 5 = 2c + 5$$

$$2c + 5 = 4 - c$$

$$3c = -1 \qquad c = -1/3$$

$$\lim_{x \to +\infty} \sqrt{x^2 + \overset{a}{1}x + 1} - x$$

$$= \frac{\left(\sqrt{x^2+1x+1} - x\right)\left(\sqrt{x^2+1x+1} + x\right)}{\left(\sqrt{x^2+1x+1} + x\right)} =$$

$x + 1$

$$= \frac{\cancel{x^2} + \overset{a}{1}x + 1 - \cancel{x^2}}{\sqrt{x^2+x+1} + x} \approx \frac{1000+1}{1000+1000}$$

$x > 0$

$$= \frac{x\left(\overset{a}{1} + x^{-1}\right)}{x\left(\sqrt{1 + 1x^{-1} + 1x^{-2}} + 1\right)}$$

$x > 0$

~~< 0~~

$$= \frac{1 + \underset{\to 0}{x^{-1}}}{\sqrt{1 + \underset{\downarrow 0}{x^{-1}} + \underset{\downarrow 0}{x^{-2}}} + 1} \xrightarrow[x \to +\infty]{} \frac{\overset{a}{1}}{\sqrt{1} + 1} \quad \frac{a}{2}$$

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

$$\sqrt{x^2(1+1x^{-1}+1x^{-2})}$$

$$=\sqrt{x^2}\sqrt{1+1x^{-1}+1x^{-2}}$$

$$|x|$$

$$\parallel$$

$x<0$ $\quad -x$

$\sqrt{ab} = \sqrt{a}\sqrt{b}$

$-1000+1 \quad -999$

$$\lim_{x\to -\infty} \frac{x+1}{-x\sqrt{1+\cdot}+x} \quad 0$$

$-8\cdot 16 \quad +14\cdot 16 \quad 96 - 88 \quad = 0$

$-128 \qquad 6\cdot 16$

$$f(x) = \frac{2x^3 + 14x^2 + 22x - 8}{x+4} \quad \checkmark$$

$x < -4$

$$f(x) = -2x^2 + 6x + a \qquad x \geq -4$$

$(2x)^2$

Find a so that $f(x)$ is continuous

$$\lim_{x \to -4^+} f(x) = -2(-4)^2 + 6(-4) + a$$

$-32 \qquad -24$

$$= -56 + a$$

$$2x^3 + 14x^2 + 22x - 8 = (x+4)(2x^2 + 6x - 2)$$

$(x - -4)$

$$\begin{array}{r|rrrr} -4 & 2 & 14 & 22 & -8 \\ \hline & 2 & 6 & -2 & 0 \end{array}$$

$0 \leftarrow P(-4)$

$$f(x) = 2x^2 + 6x - 2 \qquad x < -4$$

$$\lim_{x \to -4^-} f(x) = 2(-4)^2 + 6(-4) - 2 = 6$$

$$-56 + a = 6$$

$$a = 62$$

$$1X + 1$$

$$\cancel{X} \; \frac{1}{\cancel{10000} + 1X^{-1}}$$

$$-X\sqrt{1 + 1X^{-1} + 1X^{-2}} + \cancel{X}$$

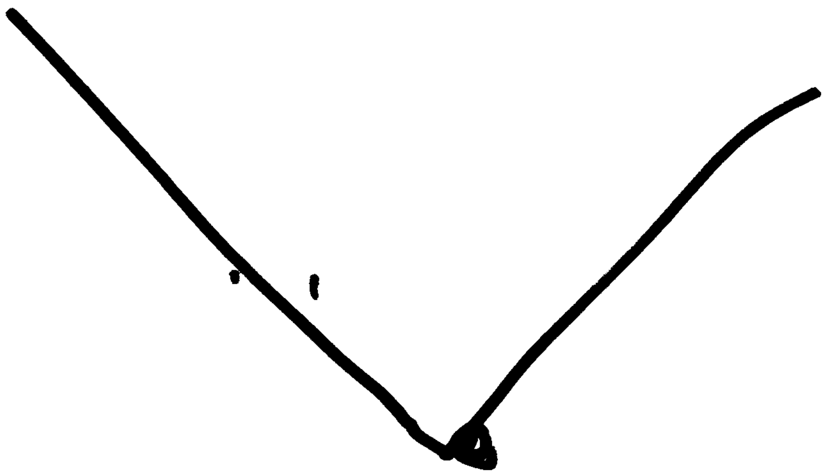
$$\cancel{X} \; \frac{1}{1 - \sqrt{1 + 1X^{-1} + 1X^{-2}}}$$

$$\frac{1}{1 - \sqrt{1.000001}}$$

$$\frac{1}{-.00001}$$

You can plug in ∞ to neg powers and get zero

+ powers ∞

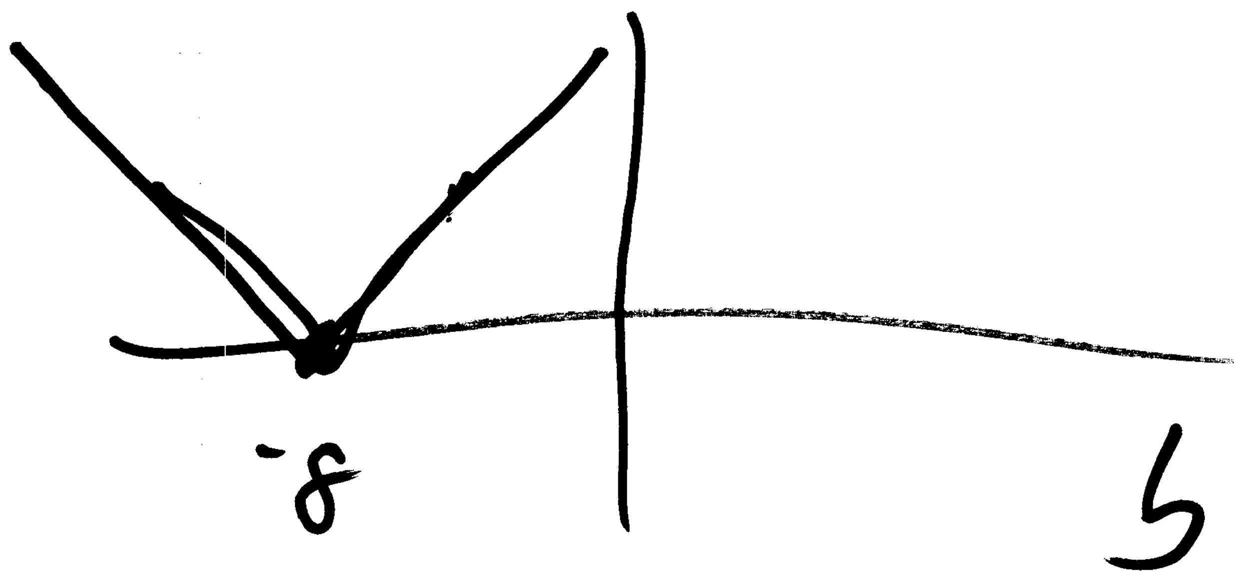


$$\lim_{x\to 0^+} \frac{|x|}{x} = \lim_{x\to 0^+} \frac{x}{x} = 1$$

$$\lim_{x\to 0^-} \frac{|x|}{x} = \lim_{x\to 0^-} \frac{-x}{x} = \lim -1 = -1$$

$$|u| = u \quad u>0$$

$$= -u \quad u<0$$



$$f(x) = 3x^{1/5} + x^{-1}$$

$$f'(x) = \frac{3}{5}x^{-4/5} - 1x^{-2}$$

$$\frac{8x^1 + 9}{11x^2 - 2x^1 + 6x^0} = \frac{x^1(8 + 9x^{-1})}{x^2(11 - 2x^{-1} + 6x^{-2})}$$

$$= x^{-1}\left(\frac{8 + 9x^{-1}}{11 - \underset{\to 0}{2x^{-1}} + \underset{\to 0}{6x^{-2}}}\right) \to \frac{8}{11}$$

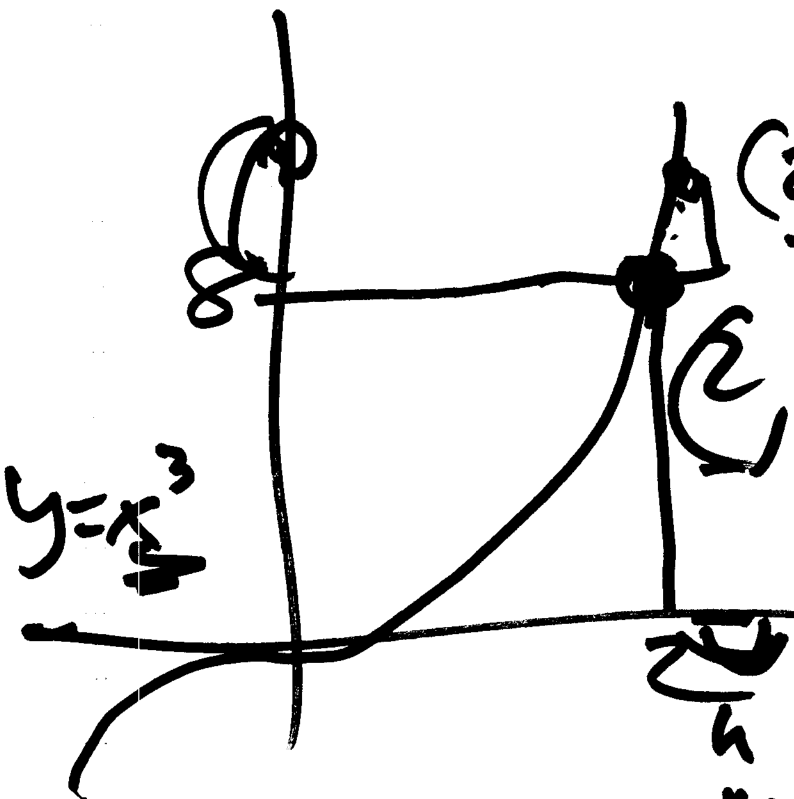
$$\to 0$$

$$y = f(x) = 11x^9 - \underline{4x^5 + 2x^3}$$

$$f'(x) = 99x^8 - 20x^4 + 6x^2$$

$x = -6$

$$f'(-6) = 99(-6)^8 - 20(-6)^4 + 6(-6)^2$$



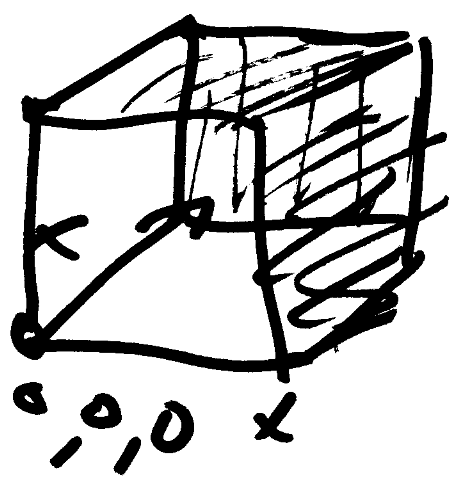
(x, x^3)

$(2+h, (2+h)^3)$

$(2, 8)$

$$m = \frac{\Delta y}{\Delta x} = \frac{(2+h)^3 - \overset{8}{2^3}}{h}$$

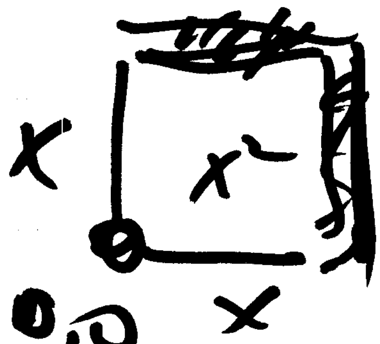
$h \to 0$



$(2+h)(2+h)(2+h)$

$1\cdot \cancel{2^3} + 3\cdot 2^2\cdot h^1 + 3\cdot 2^1 h^2 + 1h^3$

$- \cancel{2^3}$

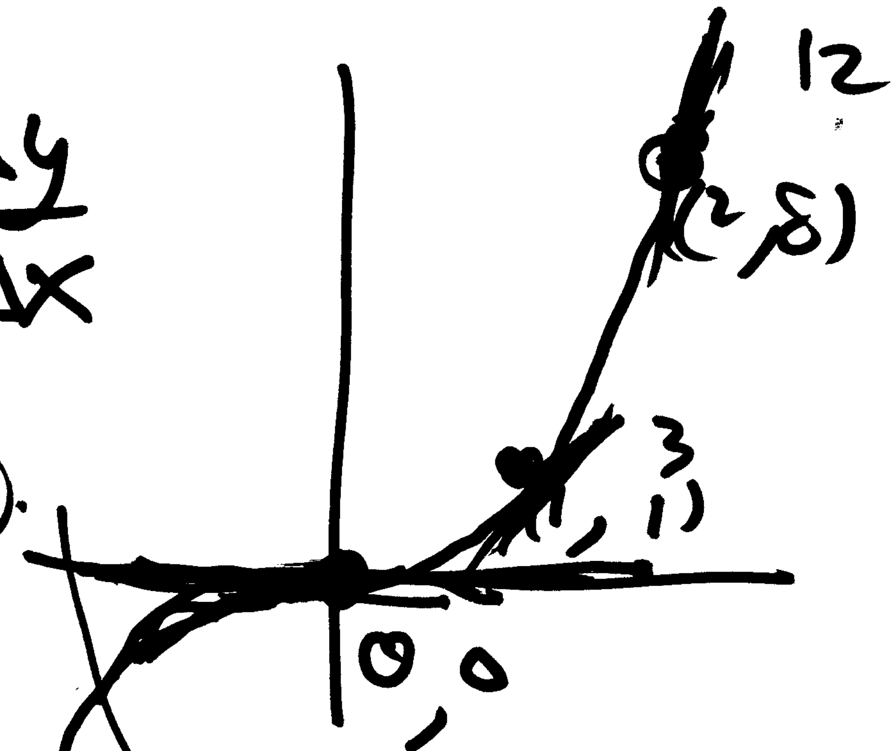


$$\frac{3\cdot 2^2 \cdot \cancel{h} + 3\cdot 2\cdot h^{\cancel{2}} + h^{\cancel{3}\,2}}{\cancel{h}} = 3\cdot 2^2 + 3\cdot 2\cdot h + h^2$$

$h \leftarrow 0 \rightarrow$

$$\lim_{\Delta x \to 0} \frac{\Delta y}{\Delta x}$$

$y = f(x) = x^3$



3, 1

$f'(x) = \underline{3x}^2$

$3 \cdot 0^2 = 0$

$3 \cdot 1^2 = 3$

$3 \cdot 2^2 = 12$

$y = f(x) = x^2$

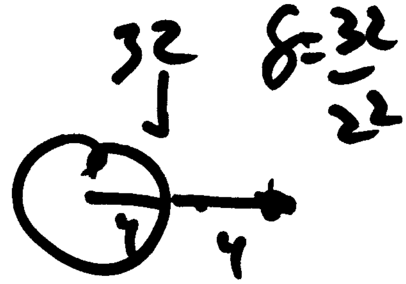
$f'(x) = 2x^1$

$f(x) = 5x^3 + 7x^2$

$f'(x) = 5 \cdot (3x^2) + 7(2x)$

$= 15x^2 + 14x$

$F = \underline{GMm} / \underline{r^2}_{R}$



$y = x^3 = f(x)$

$h(t) = 64t - 16t^2$

$= t(64 - 16t)$

$v(0) = 64$ feet/sec

$h(0) = 0 \qquad h(4) = 0$