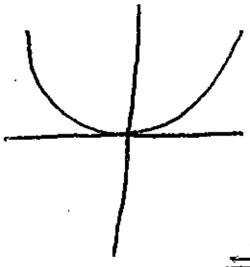
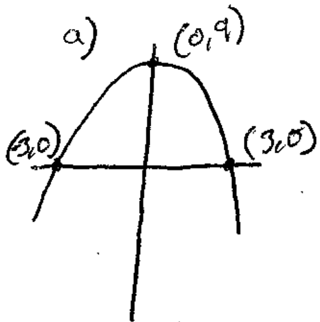
1| Draw $y=9-x^2$



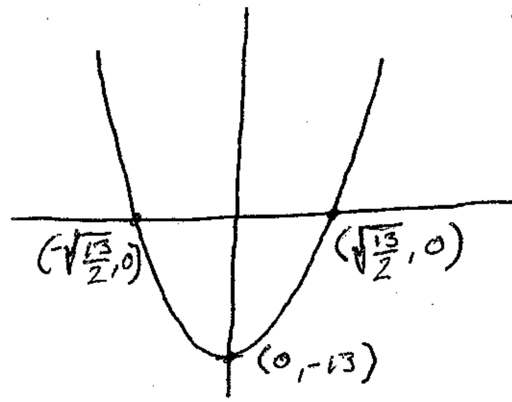
$y=x^2$ $\Rightarrow$

a)



$y=9-x^2$
$0=9-x^2$
$x^2=9$
$x=\pm 3$
x intercepts

b) $y=2(9-x^2)+5$



$0=-2(9-x^2)+5$
$9-x^2=\frac{5}{2}$
$\frac{13}{2}=x^2$
$x=\pm\sqrt{13/2}$
x intercepts

2| $f(x)=x^3-25x$, average rate of growth $\rightarrow$ Difference Quotient

from $x=10$ to $x=10.1$ $\quad \frac{f(10.1)-f(10)}{.1}=\frac{777.801-750}{.1}=\frac{27.801}{.1}$

≈ 278 people/year

from $x=10$ to $x=10.01$ $\quad \frac{f(10.01)-f(10)}{.01}=\frac{752.753-750}{.01}=\frac{2.753}{.01}$

$\approx 275.3/yr$

from $x=10$ to $x=10.001$ $\quad \frac{f(10.001)-f(10)}{.001}=\frac{750.27503-750}{.001}=\frac{.27503}{.001}$

≈ 275.03 people/yr

Guess $f'(10)=275$, $f'(x)=3x^2-25$, $f'(10)=3(10)^2-25=275$ ✓

3) $\lim\limits_{x\to 3}\left[\frac{2x}{x^2-1}-\frac{1}{x-1}\right]$ Take common denominator $\lim\limits_{x\to 3}\left[\frac{2x}{x^2-1}-\frac{1}{x-1}\cdot\frac{(x+1)}{(x+1)}\right]$

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

4) $\lim\limits_{x\to 0}\frac{\sin(4x)}{x}=f(x)$ build table of values

$f(.1)=\frac{.3894}{.1}=3.89$	$f(-.1)=\frac{-.3894}{-.1}=3.89$
$f(.01)=\frac{.03998}{.01}=3.998$	$f(-.01)=\frac{-.03998}{-.01}=3.998$
$f(.001)=\frac{.003999}{.001}=3.999$	$f(-.001)=\frac{-.003999}{-.001}=3.999$

$\Rightarrow \lim\limits_{x\to 0}\frac{\sin(4x)}{x}=4$

5) $\lim\limits_{x\to\infty}\frac{\sqrt{2x^2+5x}}{\sqrt[3]{8x^3-2}}$ evaluate powers of x $\frac{\sqrt{x^2}=x}{\sqrt[3]{x^3}=x}\to$ equal in power, evaluate leading coefficients *

$$* \quad =\frac{\sqrt{2}}{\sqrt[3]{8}}=\frac{\sqrt{2}}{2}$$

6) $f(x)=\begin{cases}4-x^2 & x\le 2\\ x-1 & x>2\end{cases}$ Is $f(x)$ continuous @ $x=2$

$f(2)=4-(2)^2=0$, to be continuous evaluate limit at $x\to 2$, Prove $\lim\limits_{x\to 2}f(x)=0$?

Take two sided limits

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

Not continuous since $\lim\limits_{x\to 2^-}f(x)\neq\lim\limits_{x\to 2^+}f(x)$

7] given $f(x)$, [redacted] $f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$ (Alt.

multiply by conjugate

$$f(x) = \sqrt{1-x} \qquad f'(x) = \lim_{h \to 0} \frac{f(x+h)-f(x)}{h} = \lim_{h \to 0} \frac{\sqrt{1-(x+h)} - \sqrt{1-x}}{h} \cdot \left(\frac{\sqrt{1-(x+h)} + \sqrt{1-x}}{\sqrt{1-(x+h)} + \sqrt{1-x}} \right)$$

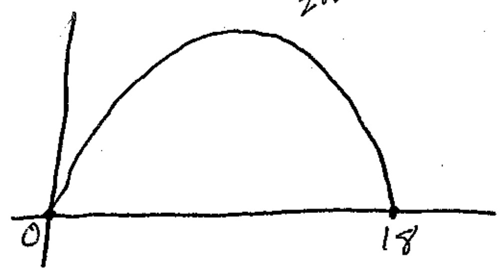
$$= \lim_{h \to 0} \frac{\cancel{1} - (\cancel{x}+h) - (\cancel{1} - \cancel{x})}{h\left(\sqrt{1-(x+h)} + \sqrt{1-x}\right)} = \lim_{h \to 0} \frac{-\cancel{h}}{\cancel{h}\left(\sqrt{1-(x+h)} + \sqrt{1-x}\right)} = \lim_{h \to 0} \frac{-1}{\sqrt{1-(x+h)} + \sqrt{1-x}} = \frac{-1}{2\sqrt{1-x}}$$

8] $f(t) = 288t - 16t^2$ hits ground at 0

$288t - 16t^2 = 0$

$t(288 - 16t) = 0$

$t = 0 \qquad t = 18$



$V(t) = f'(t) = 288 - 32t$

$f'(18) = 288 - 32(18) = -288$ ft/sec

$a(t) = f''(t) = V'(t) = -32$ ft/sec²

9] Eq'n of tangent line at $x=2$ of $f(x) = x^4 - 3x^2$

Point $x = 2$, $y = f(2) = 16 - 12 = 4 \Rightarrow (2, 4)$

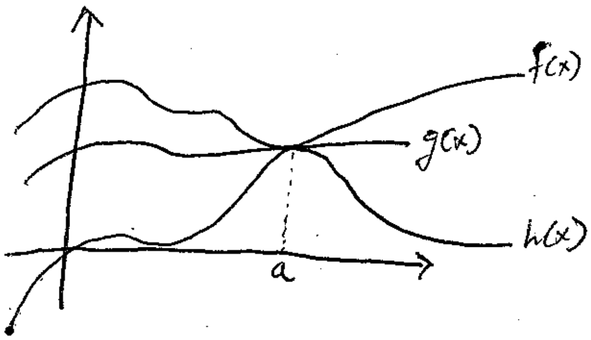
Slope $f'(x) = 4x^3 - 6x$

$f'(2) = 4(8) - 6(2) = 32 - 12 = 20$

line: $y - 4 = 20(x - 2)$

look at exponentiation (Quiz 5)

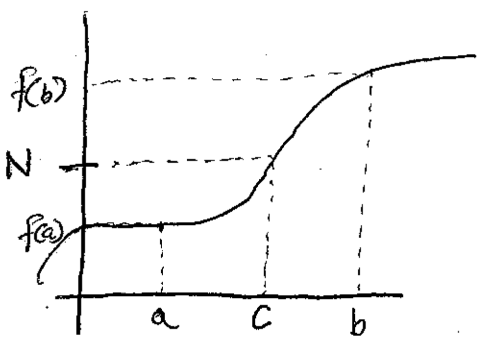
Squeez Theorem



If $\lim_{x \to a} f(x) = \lim_{x \to a} h(x) = L$

Then $\lim_{x \to a} g(x) = L$

Intermediate Value Theorem



If $f(x)$ is continuous on $[a,b]$ and N is any value between $f(a)$ + $f(b)$ then there exists c on (a,b) such that $f(c) = N$