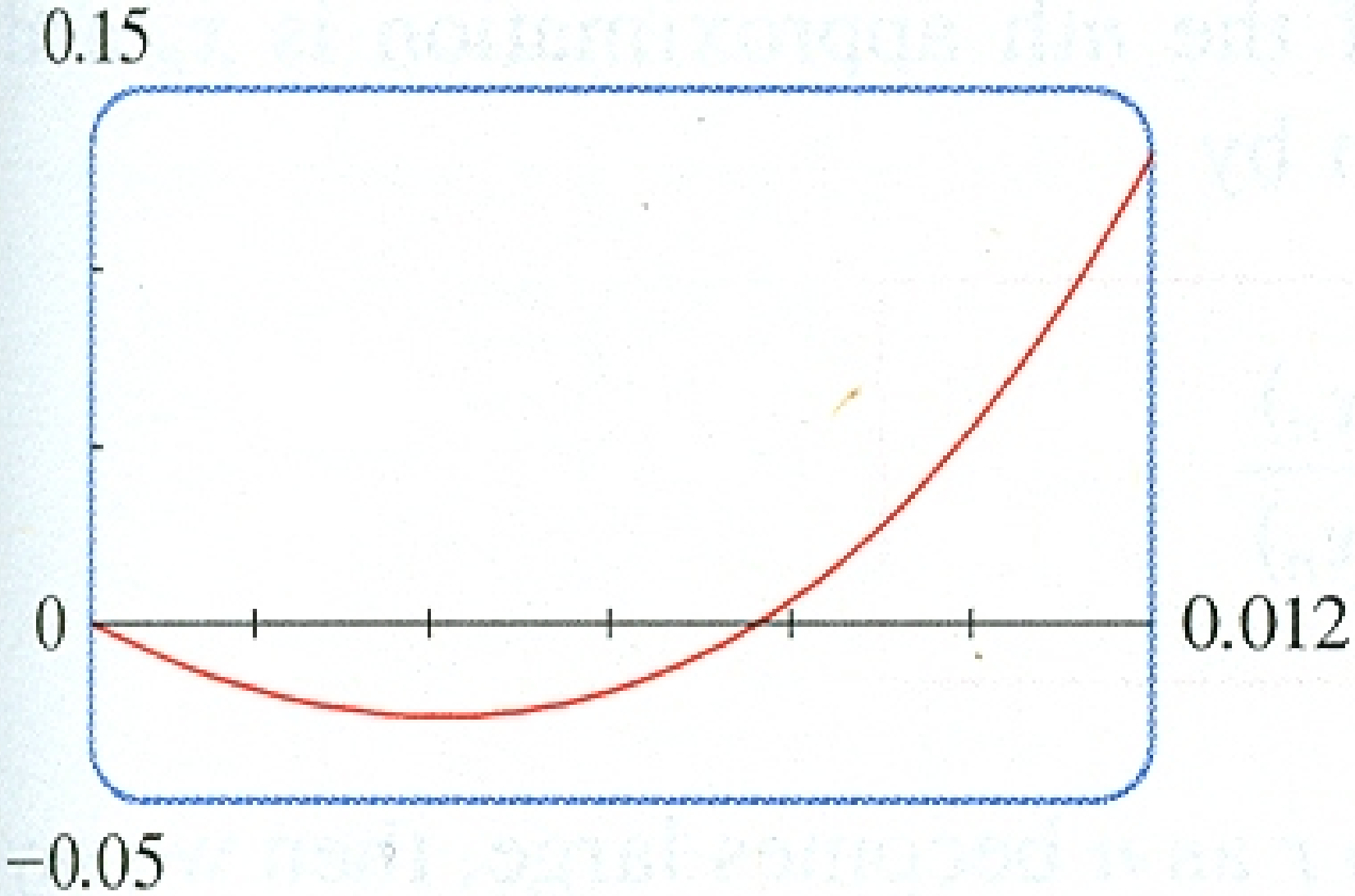
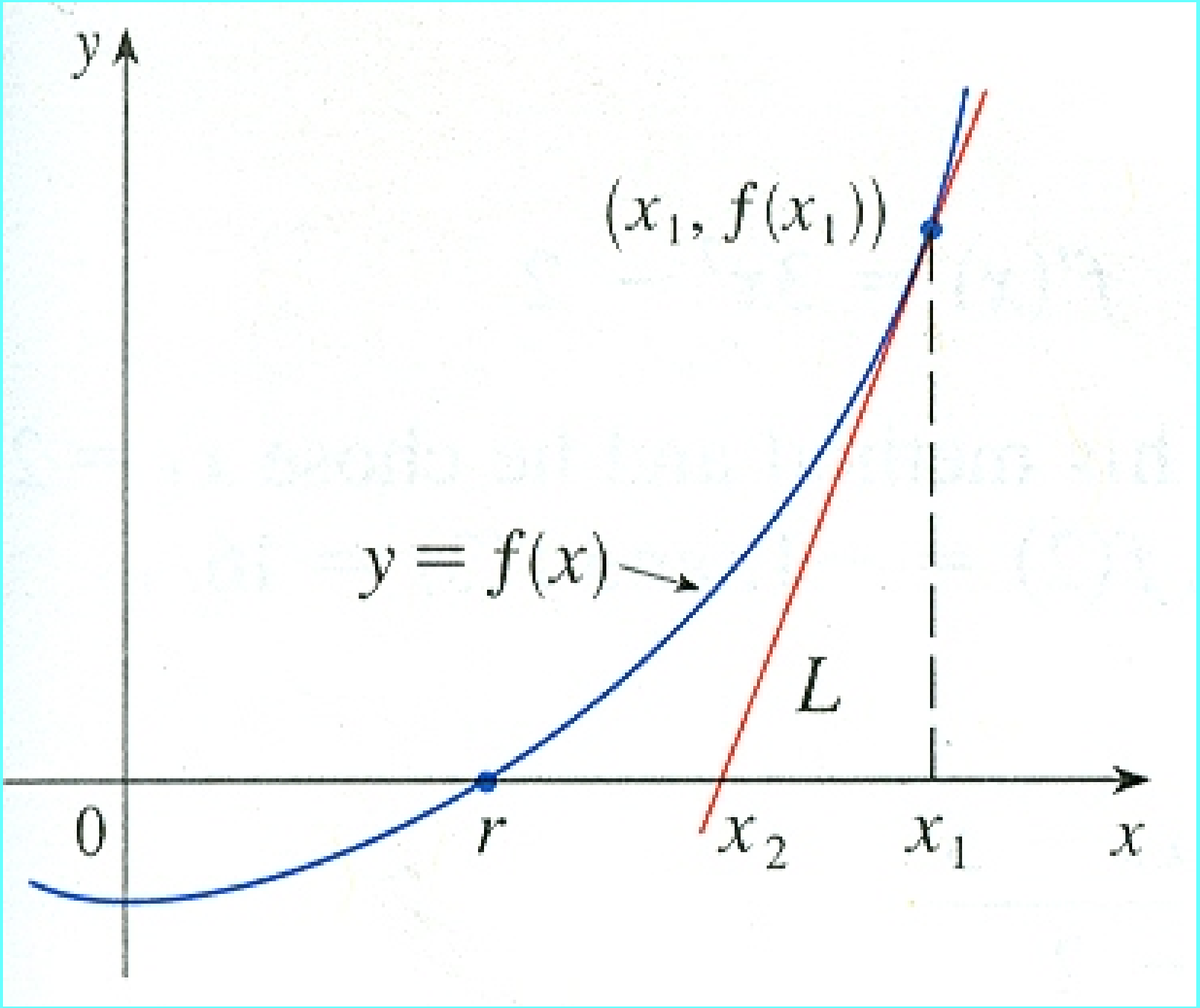
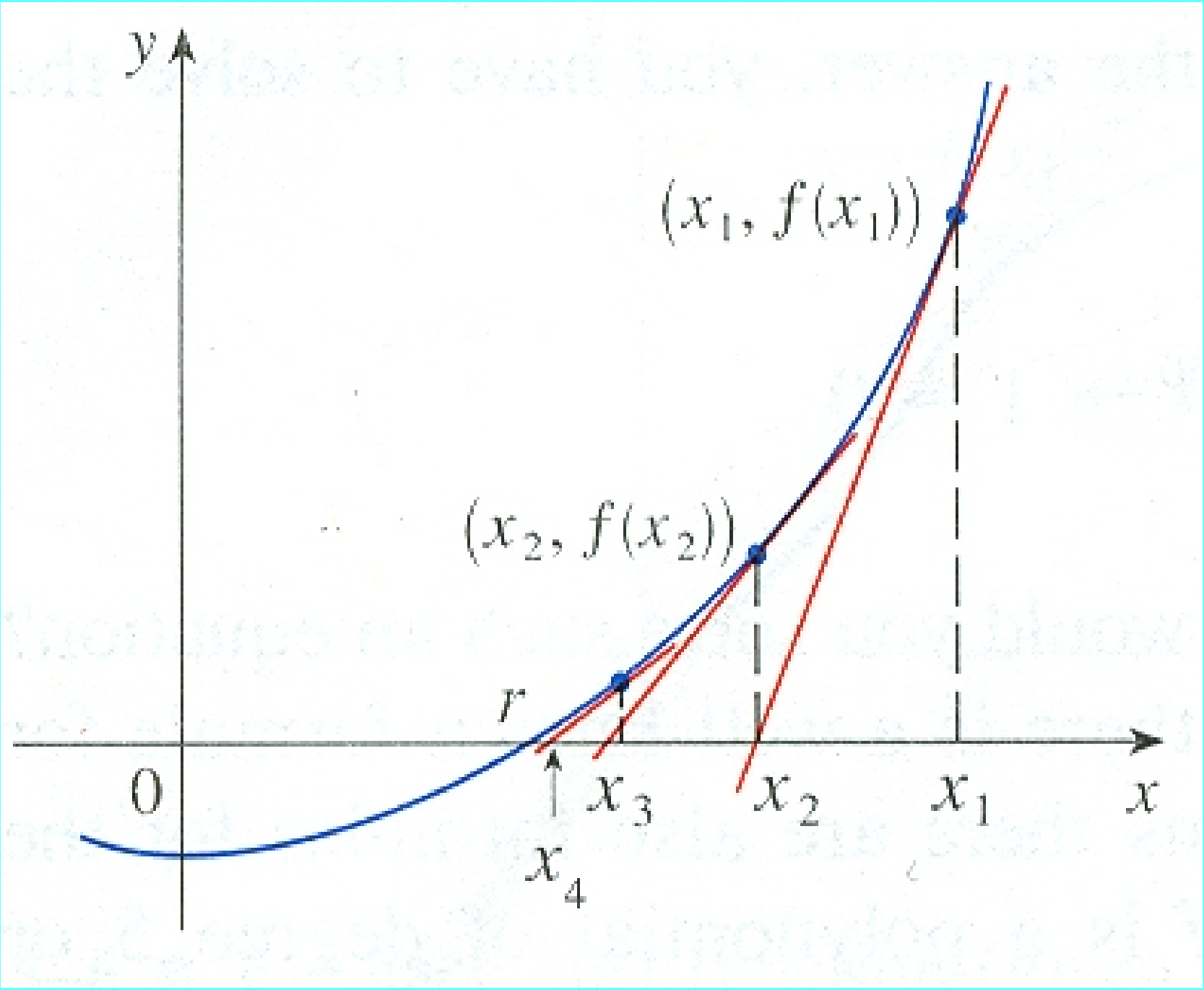
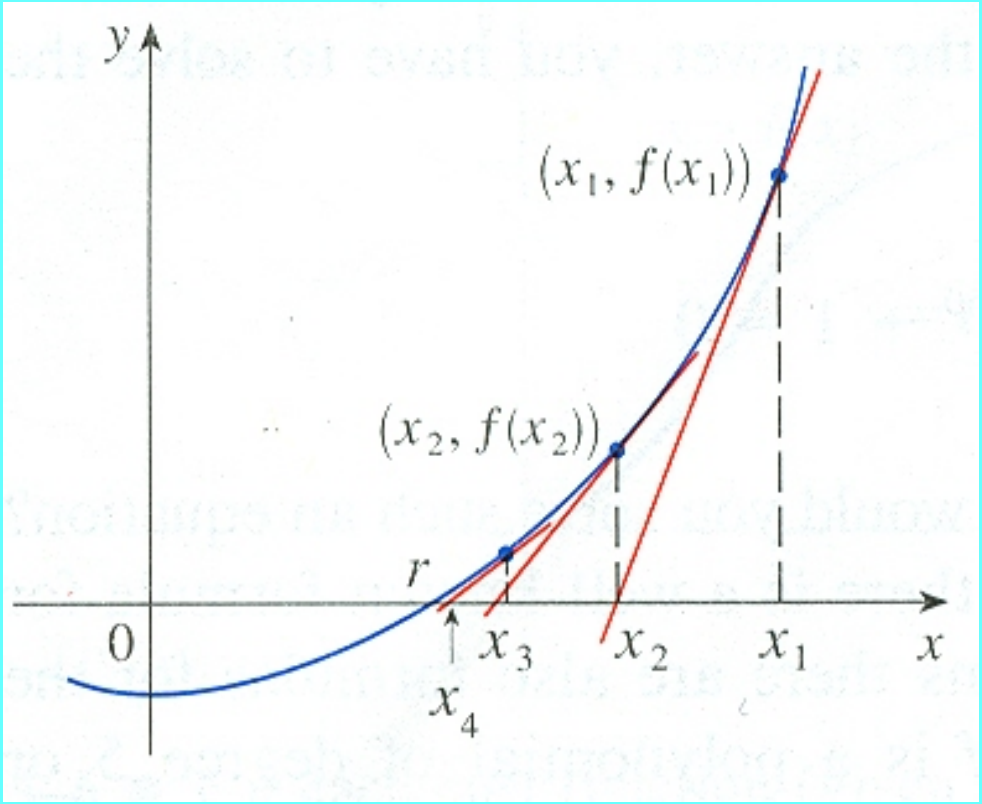
Newton's Method


0.15
0
0.012
−0.05


y
$(x_1, f(x_1))$
$y = f(x)$
L
0
r
x_2
x_1
x


y
$(x_1, f(x_1))$
$(x_2, f(x_2))$
r
0
x_3
x_2
x_1
x
x_4



$y-f(x_1)=f'(x_1)(x-x_1)$

Since x-intercept is $(x_2, 0)$

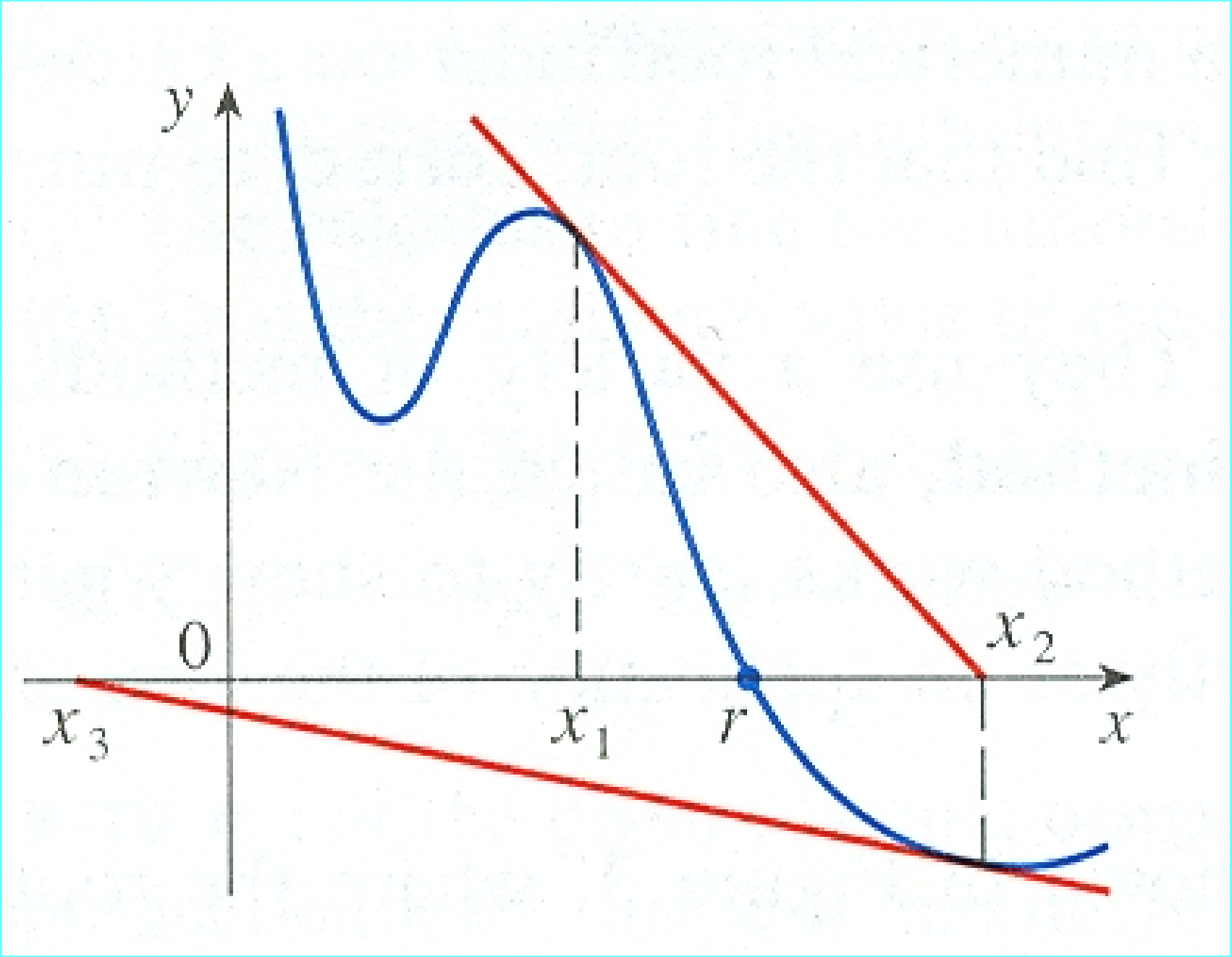
$0-f(x_1)=f'(x_1)(x_2-x_1)$

Solve for x_2:

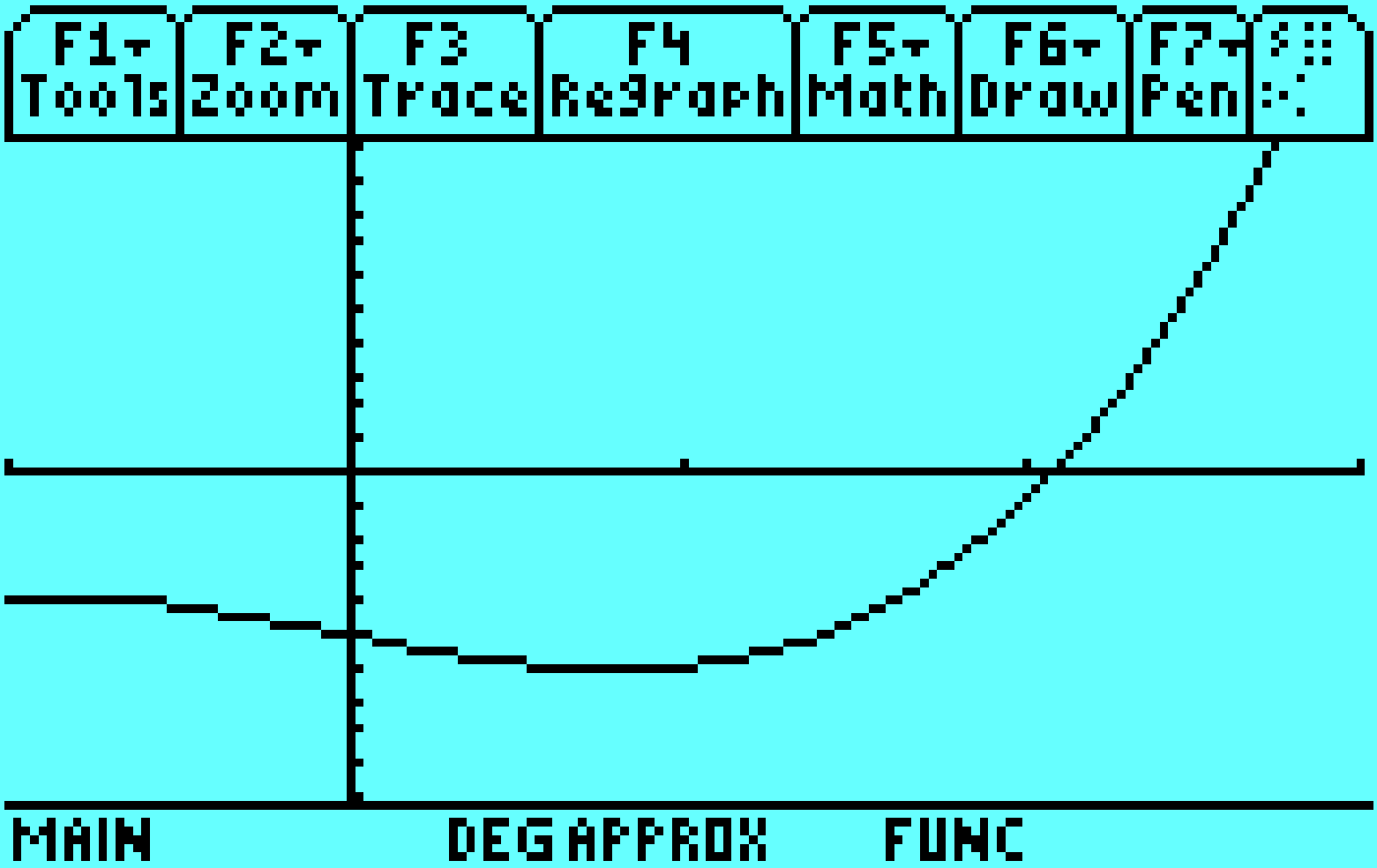
$$x_2=x_1-\frac{f(x_1)}{f'(x_1)}$$

Similar substitutions gives the pattern:

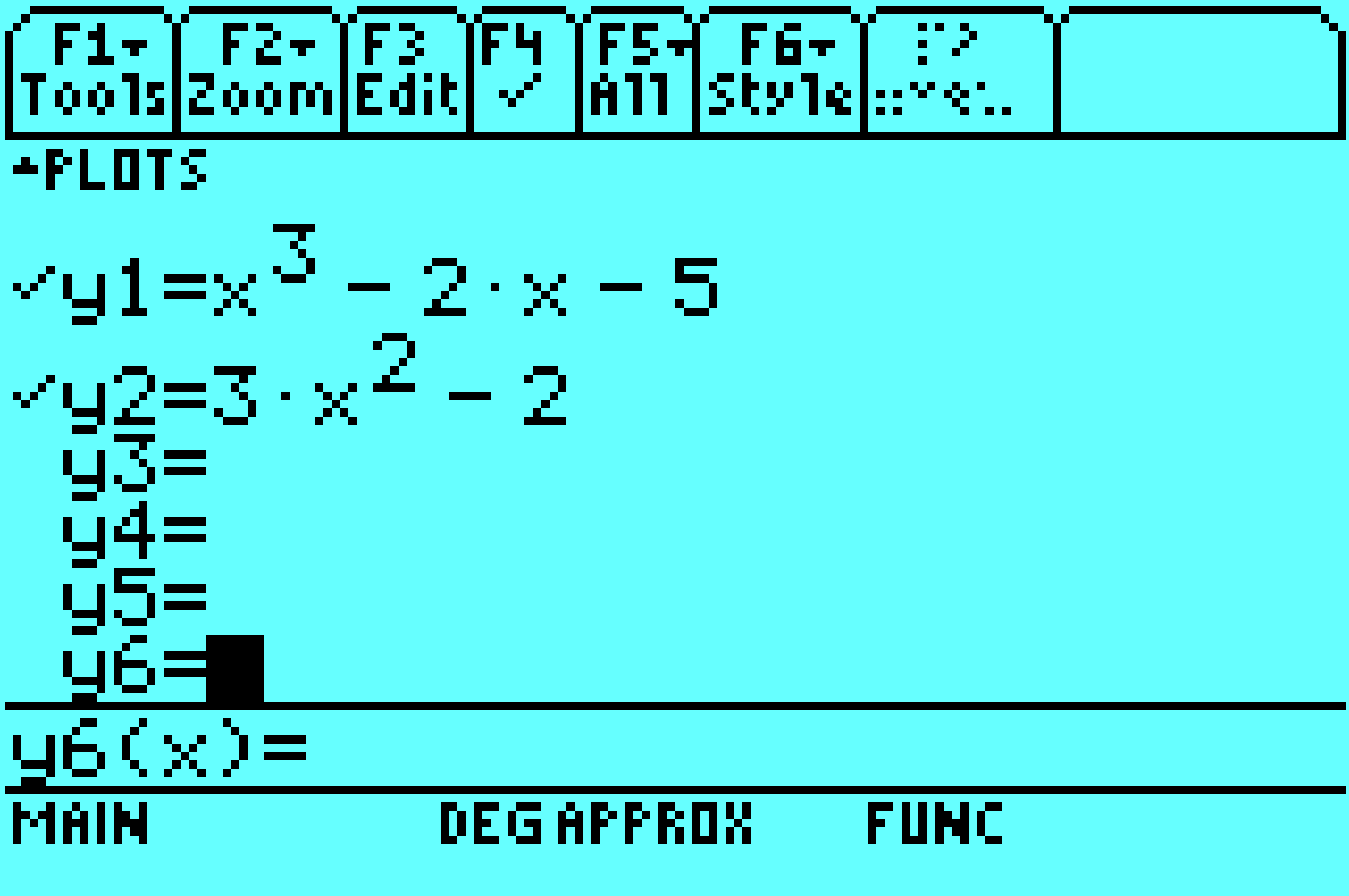
$$x_{n+1}=x_n-\frac{f(x_n)}{f'(x_n)}$$

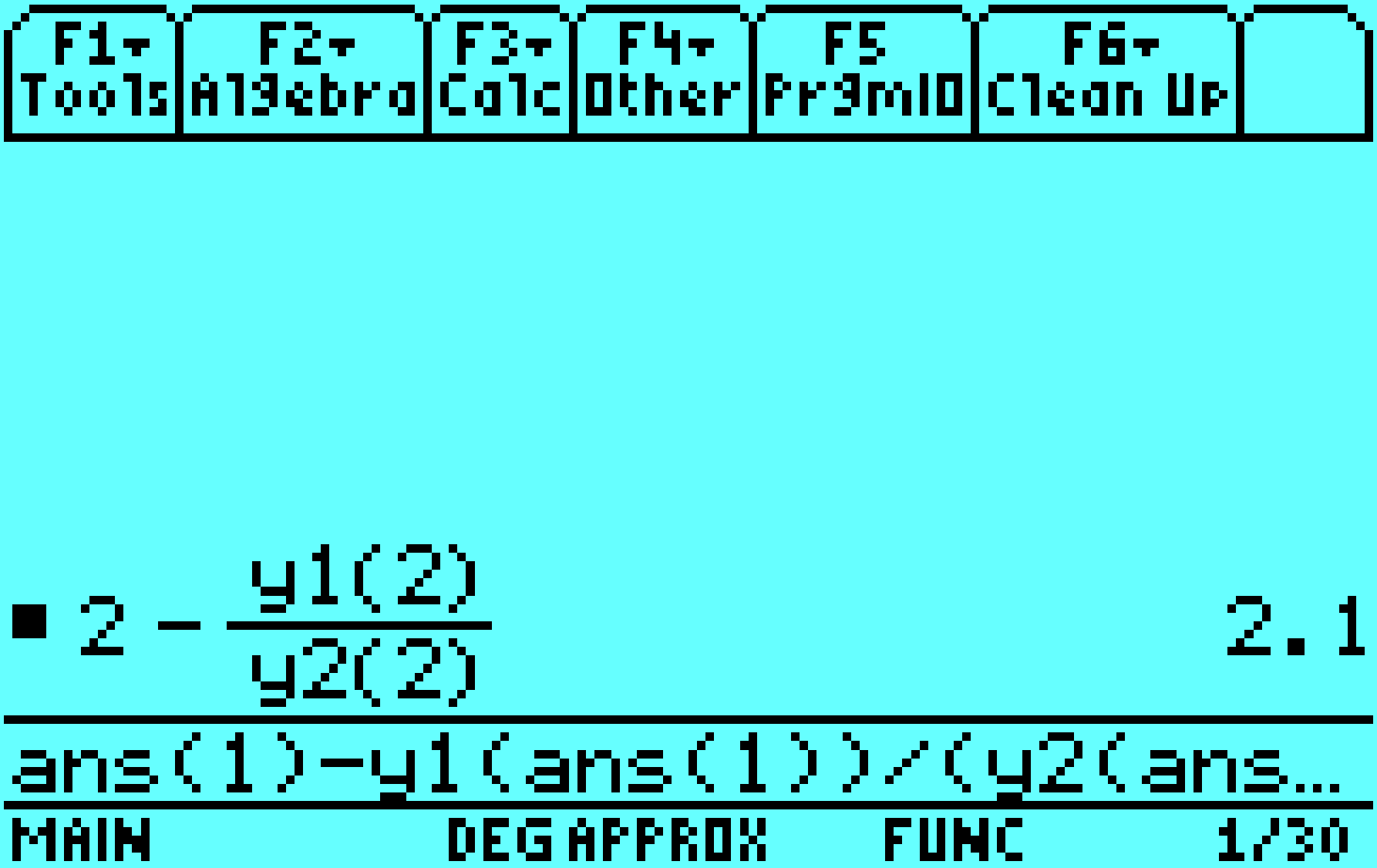

y
0
x
x_3
x_1
r
x_2

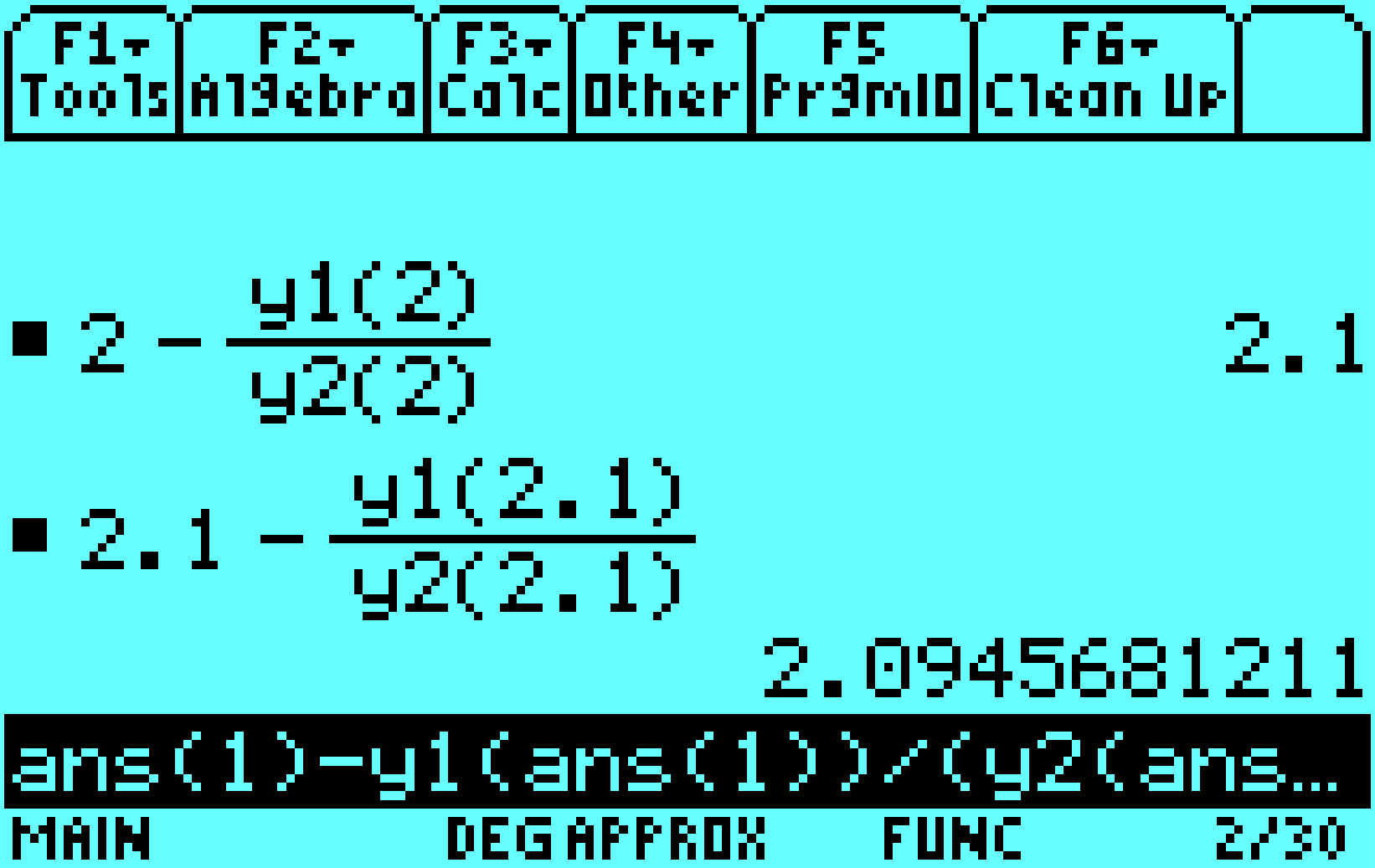
Ex: Find the root of $f(x) = x^3 - 2x - 5$

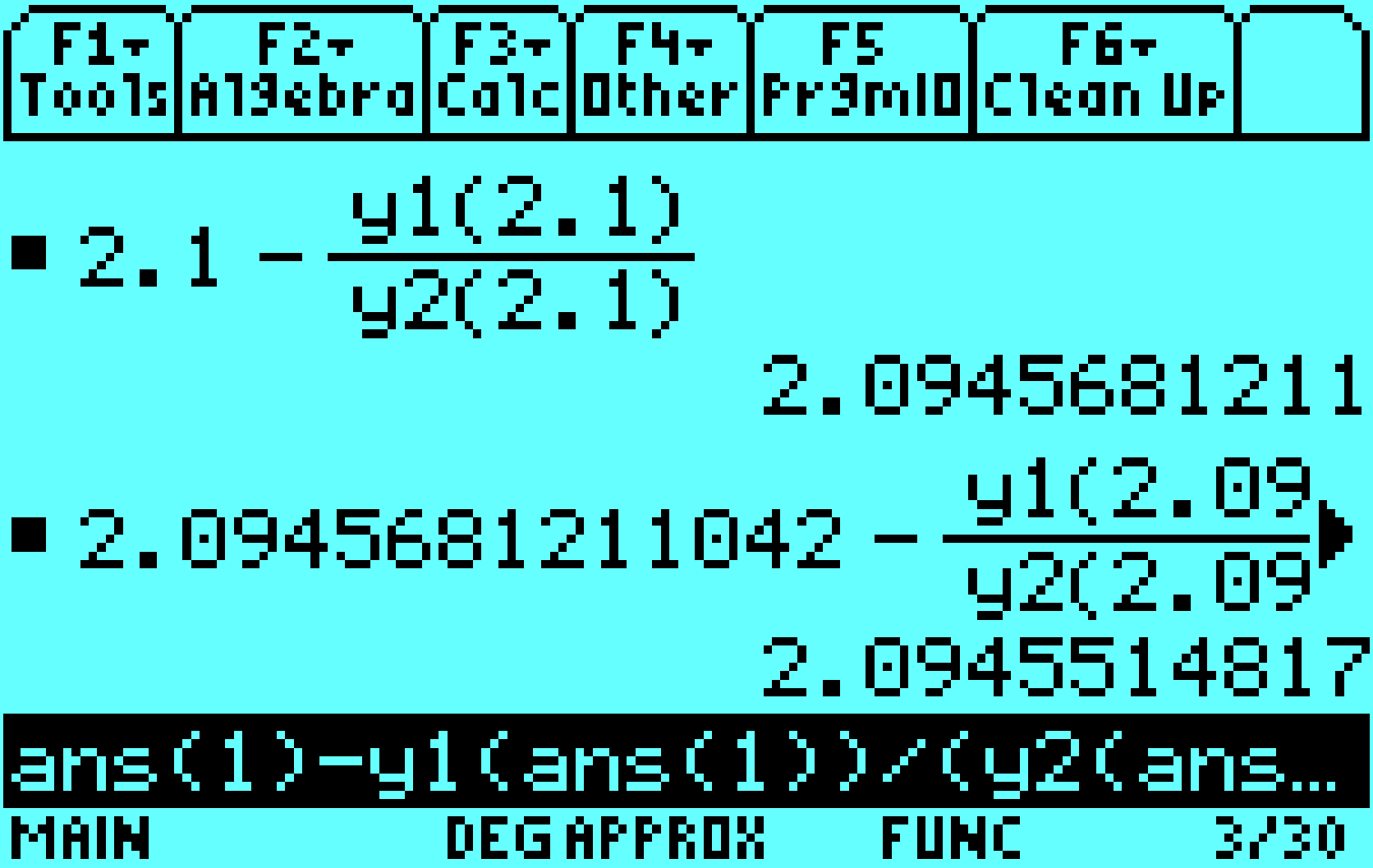


Insert function into y1 and derivative into y2




F1▾ Tools
F2▾ Algebra
F3▾ Calc
F4▾ Other
F5 PrgmIO
F6▾ Clean Up
■ 2 − y1(2)/y2(2)
2.1
ans(1)−y1(ans(1))/(y2(ans...
MAIN DEG APPROX FUNC 1/30


F1▾ Tools
F2▾ Algebra
F3▾ Calc
F4▾ Other
F5 Prgmio
F6▾ Clean Up
■ 2 − y1(2) / y2(2)
2.1
■ 2.1 − y1(2.1) / y2(2.1)
2.094568121
ans(1)−y1(ans(1))/(y2(ans...
MAIN DEG APPROX FUNC 2/30


F1▾ Tools
F2▾ Algebra
F3▾ Calc
F4▾ Other
F5 Prgmio
F6▾ Clean Up
■ 2.1 − y1(2.1) / y2(2.1)
2.094568121 1
■ 2.094568121 1042 − y1(2.09
y2(2.09
2.094551481 7
ans(1)−y1(ans(1))/(y2(ans...
MAIN DEG APPROX FUNC 3/30

F1▾ Tools | F2▾ Algebra | F3▾ Calc | F4▾ Other | F5 Prgm IO | F6▾ Clean Up

■ $2.094568121104 2 - \frac{y1(2.09}{y2(2.09}$

$2.094551481 7$

■ $2.094551481 6982 - \frac{y1(2.09}{y2(2.09}$

$2.094551481 54$

ans(1)-y1(ans(1))/(y2(ans...

MAIN DEG APPROX FUNC 4/30

F1▾ Tools | F2▾ Algebra | F3▾ Calc | F4▾ Other | F5 PrgmIO | F6▾ Clean Up

■ 2.094551481698 2 − $\frac{y1(2.09}{y2(2.09}$ ▶

2.0945514815 4

■ 2.094551481542 3 − $\frac{y1(2.09}{y2(2.09}$ ▶

2.0945514815 4

ans(1)−y1(ans(1))/(y2(ans...

MAIN DEG APPROX FUNC 5/30