$\frac{\Delta y}{\Delta x} = \frac{f(b)-f(a)}{b-a}$ → Slope of Tangent

Section 1.0 #8

8a. 38 years old

8b. 20 years

$a=20, b=21, f(a)=0, f(b)=200$

$m = \frac{200-0}{21-20} = \frac{200}{1} = $

$m = 200$

30 years

$a=30, b=31, f(a)=980, f(b)=1000$

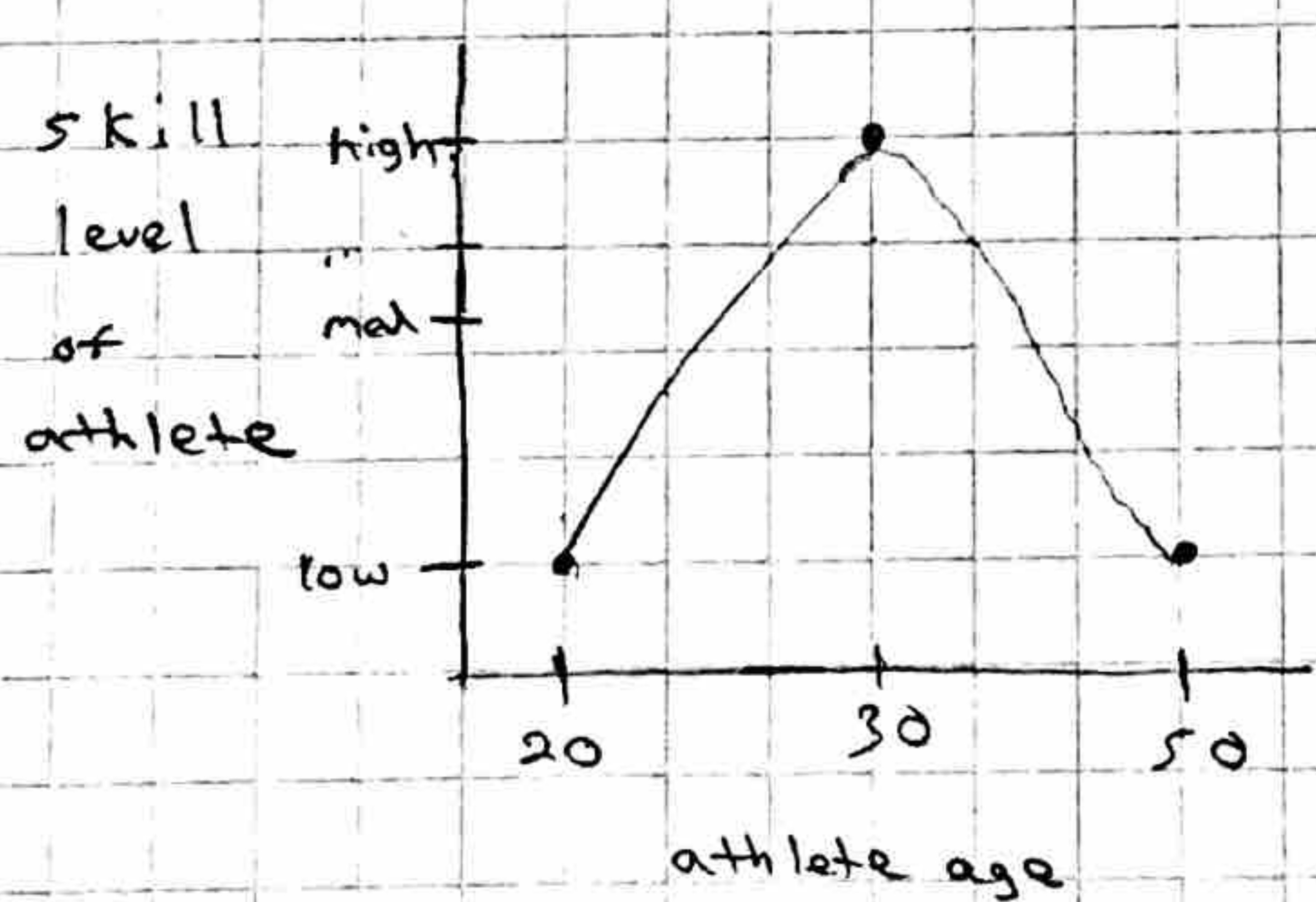
$m = \frac{1000-980}{31-30} = \frac{20}{1}$

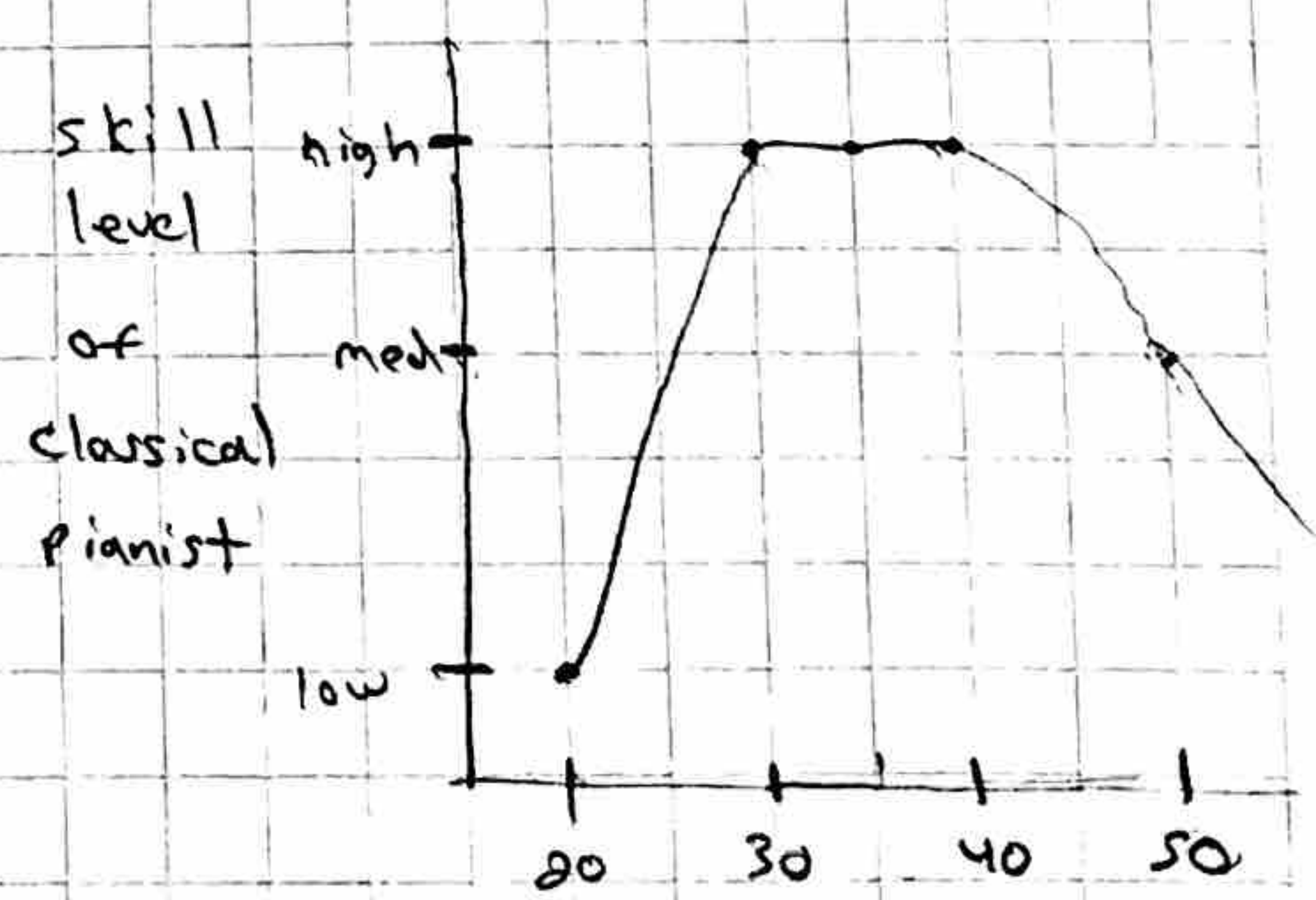
$m = 20$

Chessmaster skill is increasing rapidly around 20 years of age.

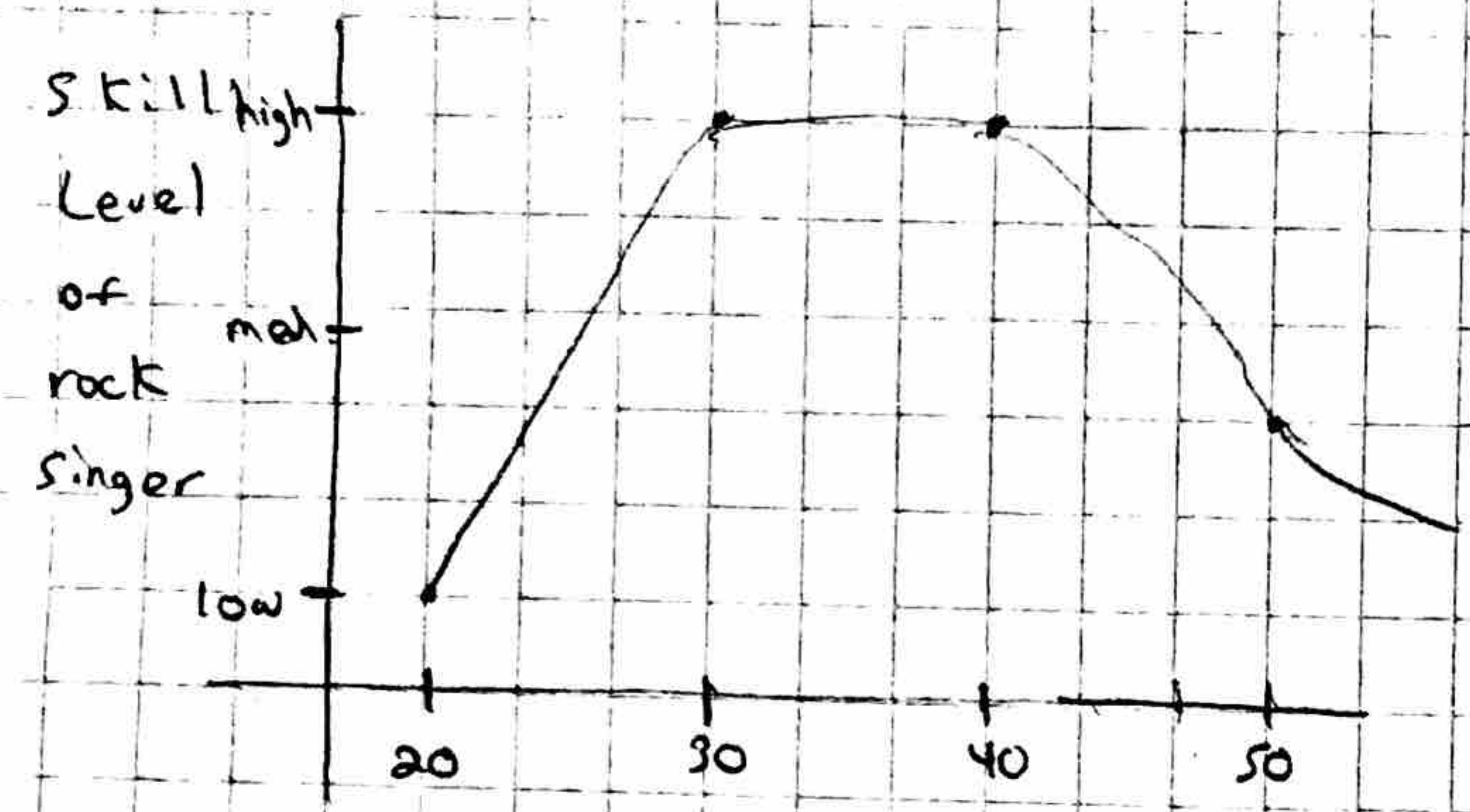
8c.
Chessmaster skill level increases rapidly between the ages 20 and 35.
Chessmaster skill level remains constant around ages 35 and 37.
Chessmaster skill level decrease at age 38.

8d.

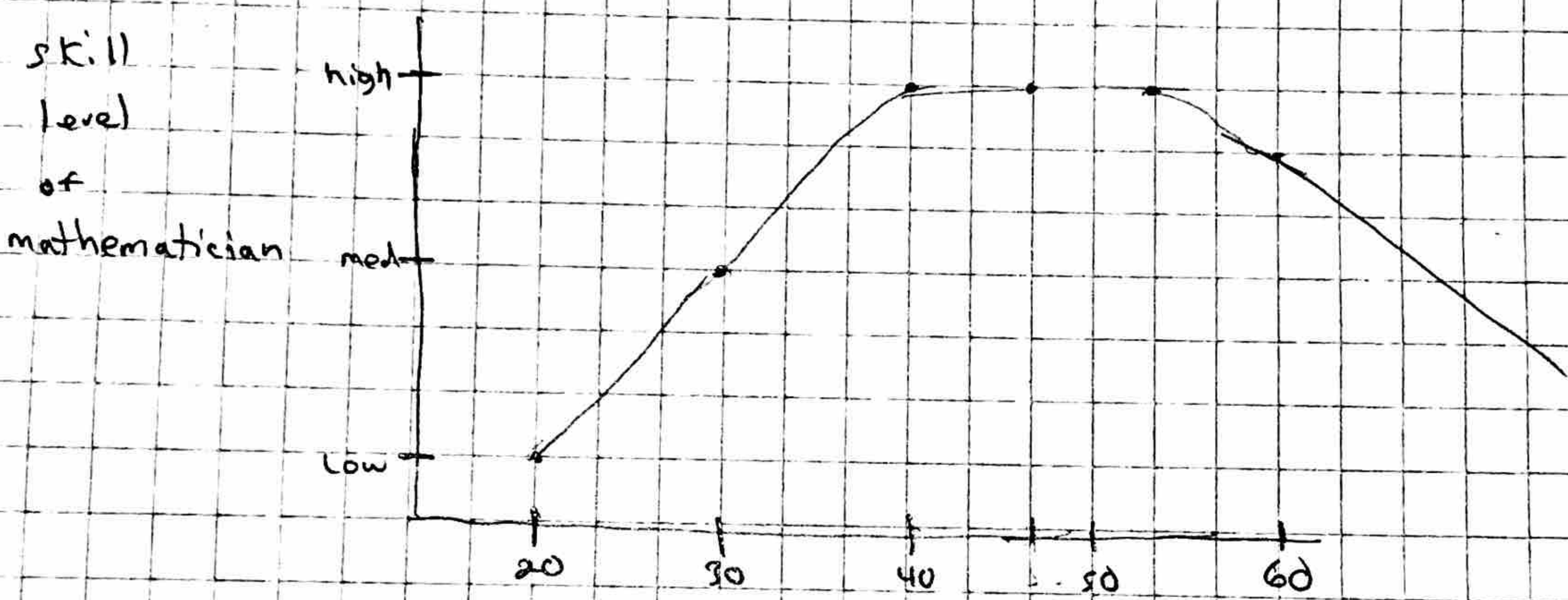




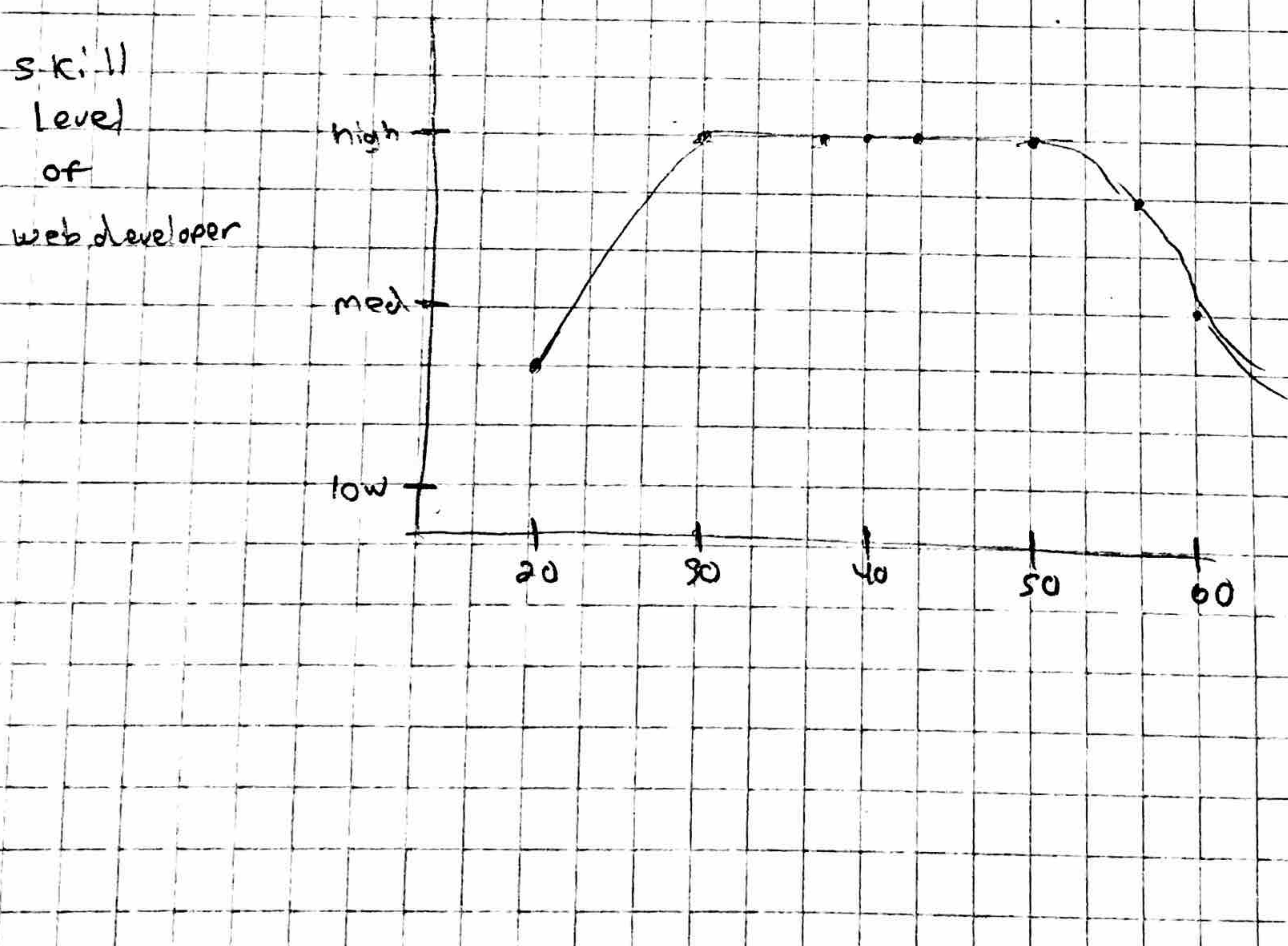
8e.


skill level of rock singer
high
med
low
20
30
40
50

8f.

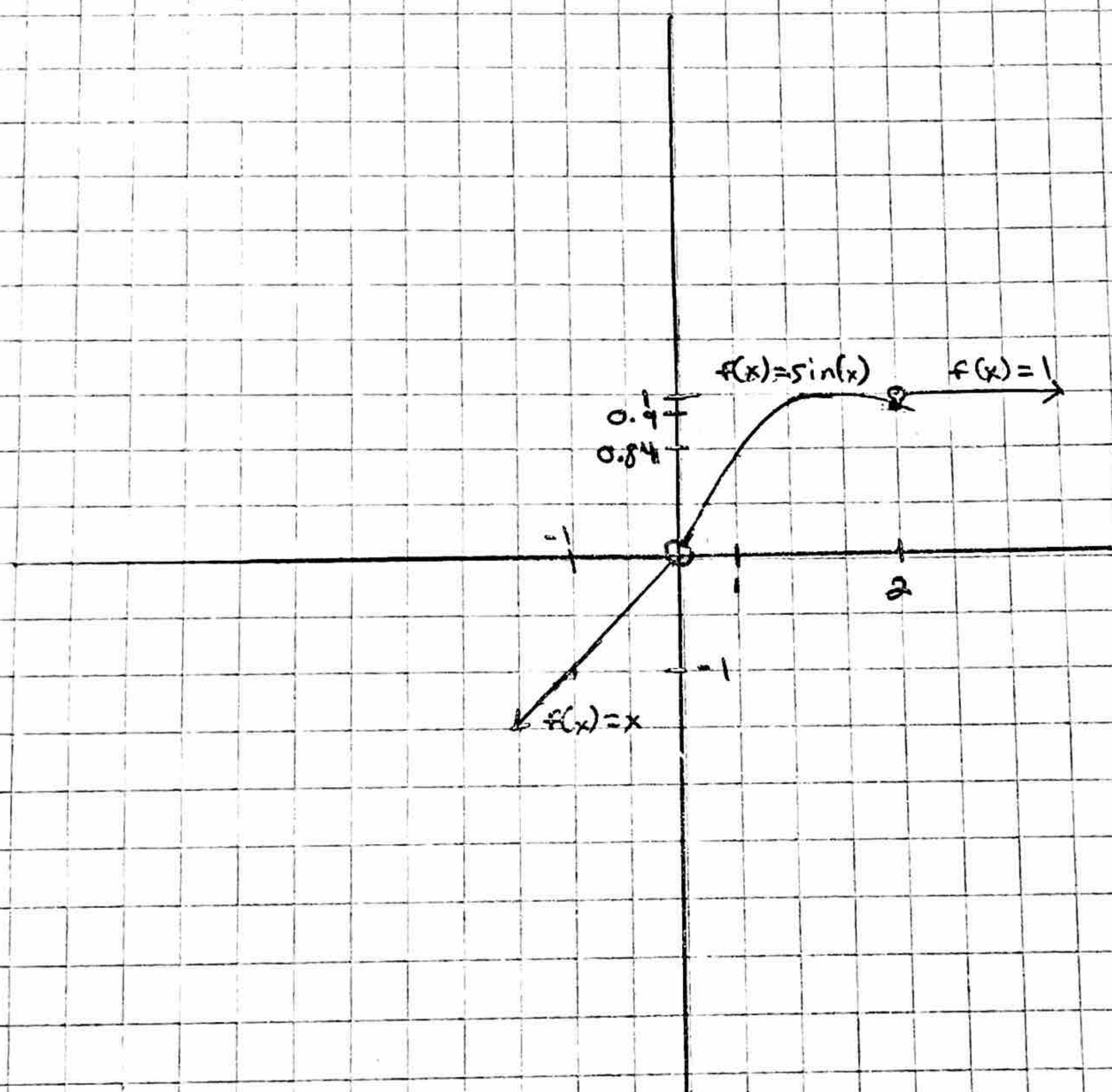

skill level of mathematician
high
med
low
20
30
40
50
60

8g.


skill level of web developer
high
med
low
20
30
40
50
60

12.

$$f(x) = \begin{cases} x, & x < 0 \\ \sin(x), & 0 < x \le 2 \\ 1, & 2 < x \end{cases}$$



$\lim_{x \to 0^-} f(x) \approx 0$

$\lim_{x \to 0^+} f(x) \approx 0$

$\lim_{x \to 0} f(x) \approx 0$

$\lim_{x \to 1^-} f(x) \approx 0.84$

$\lim_{x \to 1^+} f(x) \approx 0.84$

$\lim_{x \to 1} f(x) \approx 0.84$

$\lim_{x \to 2^-} f(x) \approx 0.9$

$\lim_{x \to 2^+} f(x) \approx 1$

$\lim_{x \to 2} f(x) \approx \text{DNE}$

Section 1.1 #16

16a. $\lim\limits_{x \to 5} \dfrac{\sqrt{x-1} - 2}{x - 5} \approx 0.25$

16b. $\lim\limits_{x \to 0} \dfrac{\sin(3x)}{5x} \approx 0.60$

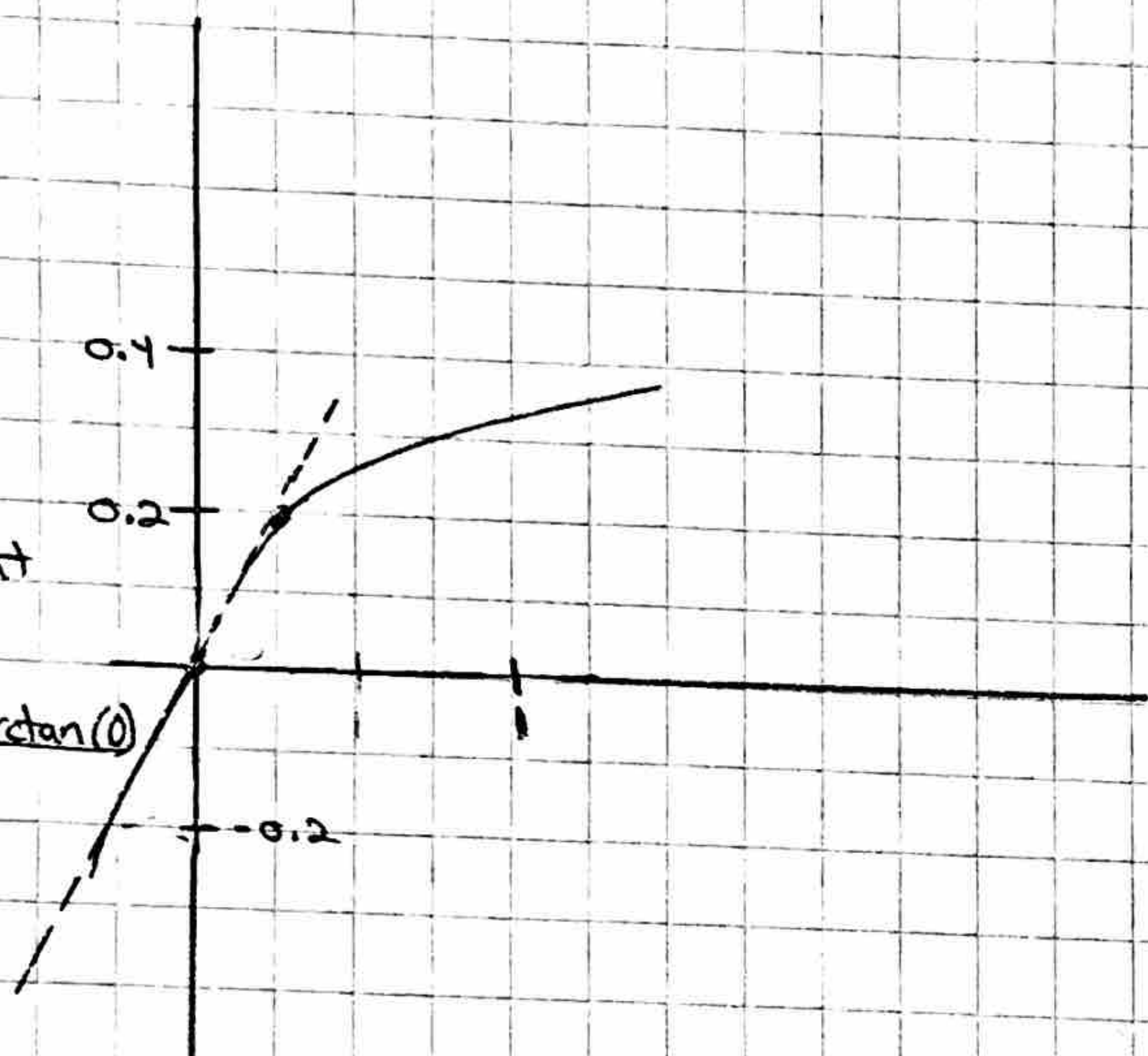
Section 1.2 #12

12. $\dfrac{\Delta y}{\Delta x} = \dfrac{f(b) - f(a)}{b - a} = \dfrac{f(a+h) - f(a)}{h}$, where $h > 0$

$b = a + h$

$h = b - a$

12a.



Slope of Tangent

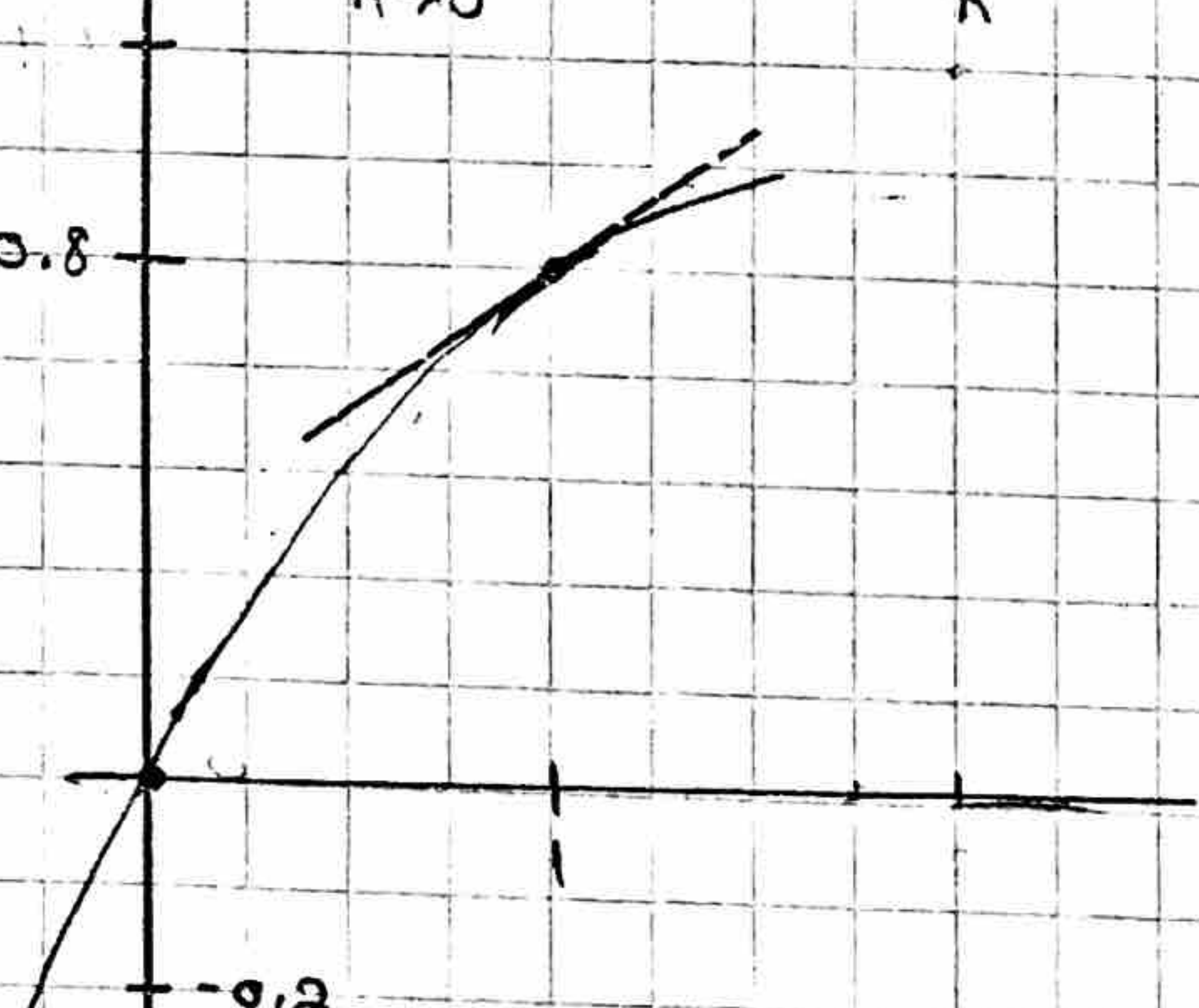
$\lim\limits_{h \to 0} \dfrac{\arctan(0+h) - \arctan(0)}{h}$

$$\boxed{\lim_{h \to 0} \frac{\arctan(0+h) - \arctan(0)}{h} \approx 1}$$

12b.

Slope of Tangent

$\lim\limits_{h \to 0} \dfrac{\arctan(1+h) - \arctan(1)}{h}$

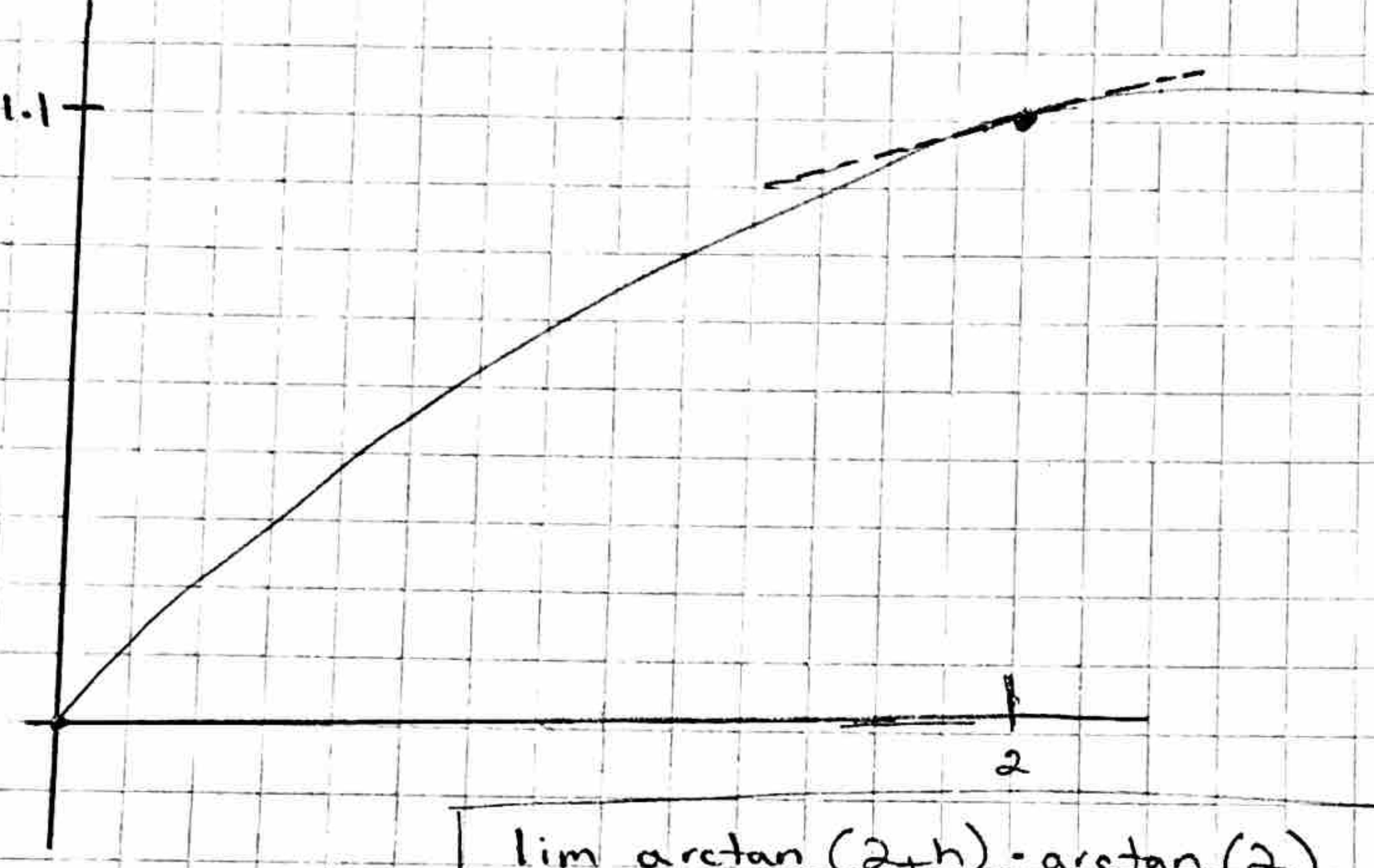


$$\boxed{\lim_{h \to 0} \frac{\arctan(1+h) - \arctan(1)}{h} \approx 0.5}$$

12c.

Slope of Tangent

$$\lim_{h\to 0} \frac{\arctan(2+h)-\arctan(2)}{h}$$



$$\boxed{\lim_{h\to 0} \frac{\arctan(2+h)-\arctan(2)}{h} \approx 0.2}$$

Section 1.2 #18

18. $x = 0$, c
$x = 1$, a
$x = 2$, b
$x = 3$, c
$x = 4$, d
$x = 5$, a
$x = 6$, c

20. $\lim_{x \to 2} \frac{|x-2|}{x-2}$

Section 1.2 # 20

$f(x) = \frac{|x-2|}{x-2}$

$x \to 2^-$

x	$f(x)$
1.7	-1
1.8	-1
1.9	-1

$x \to 2^+$

x	$f(x)$
2.3	1
2.2	1
2.1	1

$\lim_{x \to 2^-} \frac{|x-2|}{x-2} = -1$

$\lim_{x \to 2^+} \frac{|x-2|}{x-2} = 1$

$$\lim_{x \to 2^-} \frac{|x-2|}{x-2} \neq \lim_{x \to 2^+} \frac{|x-2|}{x-2}$$

limit do not exist

8. $[1, 9]$, $a = 0$, $b = 9$, $x = (a+b)/2$

$x = (1+9)/2$ <u>Iteration 1</u>

$10/2$

$x = 5$

f is negative at $x = 5$

new interval $[1, 5]$

$x = (1+5)/2$ <u>Iteration 2</u>

$6/2$

$x = 3$

f is positive at $x = 3$

new interval $[3, 5]$

$x = (3+5)/2$ <u>Iteration 3</u>

$8/2$

$x = 4$

$\boxed{\text{Near } x = 4,\ f = 0 \text{ where Bisection Algorithm converge}}$

22a. Yes, if you draw the line parallel to the diagonal.

22b. Validate $f(x)=x$ for $[0,1]$ using Intermediate Value Theorem.

$a=0,\ b=1,$

$f(a)=f(0)=0$
$f(b)=f(1)=1$

$f(a)=0,\ f(b)=1,\ f(c)=0.5$

$\begin{array}{ccccc} f(a) & & f(c) & & f(b) \\ 0 & \le & 0.5 & \le & 1 \end{array}$

$0.5=x,\ 0.5=c$

$a=0,\ b=1,\ c=0.5$

$0 \le 0.5 \le 1$

$\boxed{f(c)=c}$

Proof: Since $f(c)=c$ is true for $f(x)=x$

$a=0,\quad b=1$
$f(a)=0$
$f(b)=1$

$f(a)=0,\ f(b)=1,\ f(x)=x,$ for all x values

$0 \le x \le 1$

$a=0,\ b=1,\ c=x$

$0 \le c \le 1$

$\boxed{\text{If } c=x, \text{ then } f(c)=c}$

$\therefore$ By Truth Table, $f(c)=c$ is true.

22c. Part a gave me a view of f where $f(x) = x$.

22d. False because 0 and 1 have to be included in the interval.

12. $f(x) = x^2$

Section 1.4

$10 - E$ $\qquad$ $10 + E$

$\sqrt{10-E} < \sqrt{x^2} < \sqrt{10+E}$

$\sqrt{10-E} < x < \sqrt{10+E}$

within 0.06 inches

$\sqrt{10-0.06} < x < \sqrt{10+0.06}$

$$\frac{(\sqrt{10-0.06}) - (\sqrt{10+0.06})}{2}$$

$x = 0.00949$

Get shortest distance

$\sqrt{10-0.06} - 0.00949$ $\qquad$ $\sqrt{10+0.06} - 0.00949$

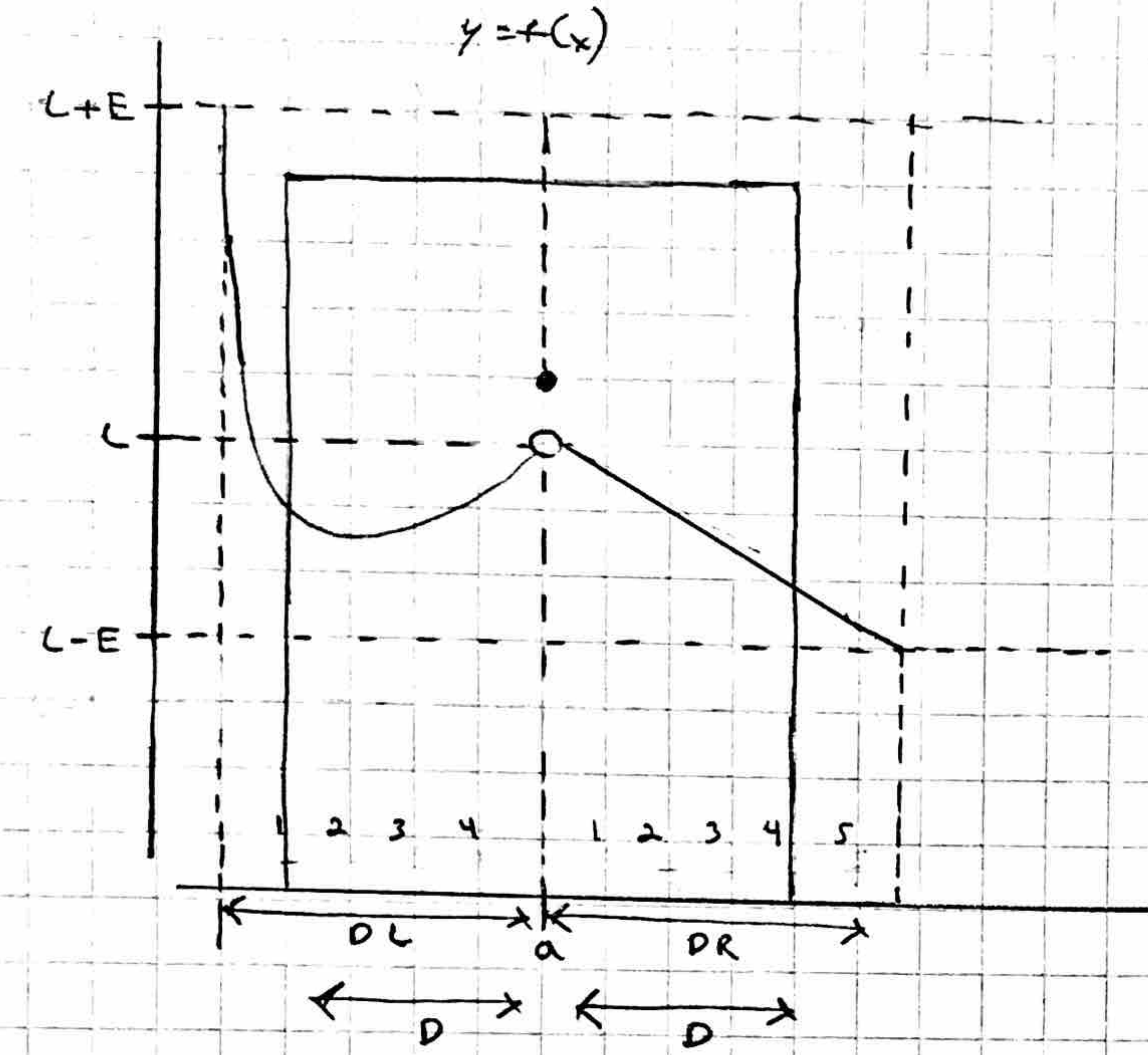
$x = 3.14329$ $\qquad$ $x = 3.16226$

$3.14329 / 4$ wires

0.785823

$\boxed{\text{0.8 inches of the 5 inches of each wire.}}$

16.



Section 1.4

ε =