DAY 29 §2.2 Derivative @ a Point

p.p. 87–89 #1, 2, 4, 10–20 all

① $f(x) = x^3$ near $x = 2$

x	1.998	1.999	2.000	2.001	2.002
x^3	7.976	7.988	8.000	8.012	8.024

estimate $f'(2)$ using table

$$f'(2) \approx \frac{8.012 - 7.988}{2.001 - 1.999} = \frac{0.024}{0.002} = 12$$

② $f(x) = x^3$

estimate inst. vel @ $x=1 \Rightarrow \dfrac{Y_1(1.001) - Y_1(0.999)}{(1.001 - 0.999)} = 3.000001$

④ $f(x) = e^x$ a)

x	1	1.5	2	2.5	3
$f(x)$	2.718	4.481	7.389	12.182	20.086

TI-efficiency USE TABLE set INDPT $\boxed{\text{ASK}}$

b) AVG RATE of CHG @ $x \in [1,3] = \dfrac{(20.086 - 2.718)}{(3-1)} = 8.684$

c) APPROX INST. RATE OF CHG @ $x = 2$

$$\frac{12.182 - 4.481}{2.5 - 1.5} = \frac{7.701}{1} = 7.701$$

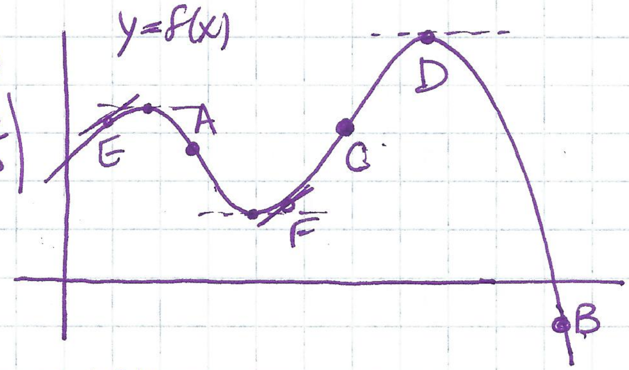
⑩ Larger Quantity: (see figure 2.18)

a) AVG RT btwn 1 & 3.
b) $f(5)$
c) $f'(1)$

⑪ (see figure 2.19)

x	$g(x)$
d	0
b	$\frac{1}{2}$
c	2
a	$-\frac{1}{2}$
e	-2

⑫ (figure 2.20)



A) $f'(x) < 0$
B) $f(x) < 0$
C) derivative is largest
D) $f'(x) = 0$
E) } same $f'(x)$ value.
F)

⑬ $f(100) = 35$ $f'(100) = 3$

estimate $f(102)$ using the linear equation

$$y = 3(x - 100) + 35$$

$$y(102) = 3(2) + 35 = 41$$

LINEAR APPROXIMATION

DAY 29 §2.2 Derivative at a Point

p. 88-89 #14-20

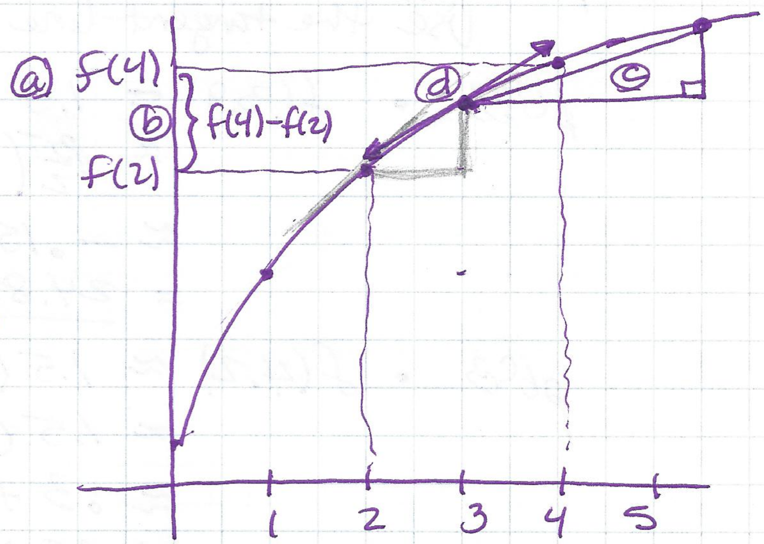
(14) Represent on the graph

a) $f(4)$

b) $f(4)-f(2)$

c) $\dfrac{f(5)-f(2)}{5-2}$

d) $f'(3)$



(15) Same figure ↗

a) $f(4) > f(3)$ b/c the graph of $f(x)$ is increasing; as x increases y increases.

b) $f(2)-f(1) > f(3)-f(2)$ b/c the graph is increasing at a decreasing rate so the incremental change in y is decreasing as x increases.

c) $\dfrac{f(2)-f(1)}{2-1} > \dfrac{f(3)-f(1)}{3-1}$ b/c the secant slope is decreasing as x increases

d) $f'(1) > f'(4)$ b/c the tangent slope is decreasing as x increases.

All of this implies that the graph is CONCAVE DOWN which we will learn.

(16) least ⟷ greatest.

$f'(3)$ $\approx \frac{2}{3}$ $f'(2)$ ≈ 1 $f(3)-f(2)$ $\approx \frac{3}{2}$

DAY 29

(17) $f(4) = 25$, $f'(4) = 1.5$ } TANGENT LINE to $f(x)$ at $(4, 25)$ is

$$y = 1.5(x-4) + 25$$

✓ pt A = (4, 25)

Use the tangent line to approximate:

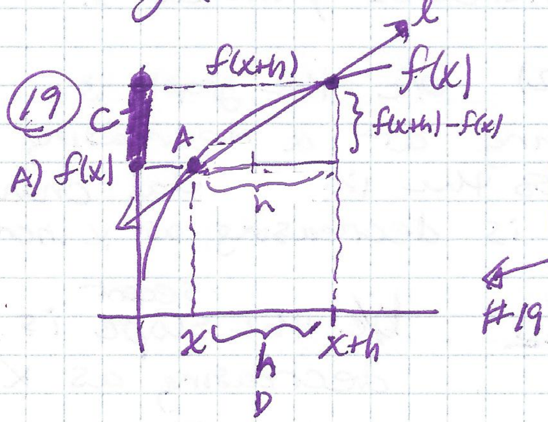
pt C • $f(3.9) \approx 1.5(3.9-4) + 25$
$\approx 1.5(-.1) + 25$
$\approx -.15 + 25$
$= \underline{24.85}$

pt B • $f(4.2) \approx 1.5(4.2-4) + 25$
$\approx 1.5(.2) + 25$
$\approx .3 + 25$
$\approx \underline{25.3}$

(18) $g(2) = 5$

$g'(2) = -0.4$ b/c $\dfrac{5-5.02}{2-1.95} = \dfrac{-.02}{.05} = -.4$

(19)



a) $f(x)$ b) $f(x+h)$ c) $f(x+h) - f(x)$

d) h.

e) $\dfrac{f(x+h) - f(x)}{h}$ = slope of line l

#19

#20

(20)