Source:

1 | cube root

1.1 | approximation

$$(1 + x)^{\frac{1}{3}} \to \frac{1}{3}(1 + x)^{\frac{-2}{3}}$$

at $x = 0$ is

$$\frac{1}{3}(1 + 0)^{\cdots} = \frac{1}{3}$$

so the linear approximation is

$$y = m(x - 0) + f(0) = \frac{1}{3}x + 1$$

1.2 | estimations

value	estimate
0.05	1.016666
-0.25	0.916666

These will be overestimates because the graph is concave down in this reigon.

2 | sin(x)

2.1 | approximation

$$y = \frac{d}{dx}\sin x\Big|_0 (x - 0) + \sin 0 = x$$

2.2 | remainder skipped temporarily

3 | unknown function (only some points known

3.1 | approximation

$$y = \frac{d}{dx}f(x)\Big|_c (x - c) + f(c)$$

plugging in $c = 1$,

$$y = 5(x - 1) - 4$$

3.2 | estimations

value	estimate
1.2	-3