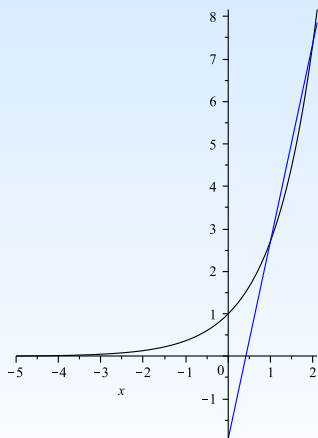


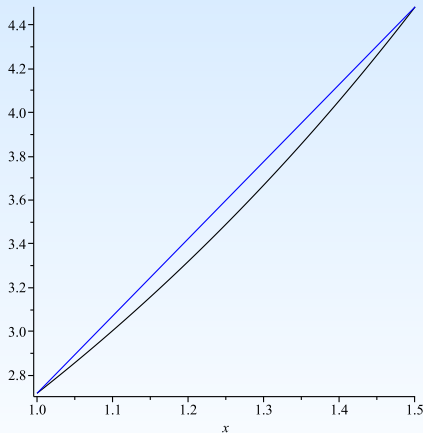
Goal: Estimate the rate $f(x) = e^x$ changes at the point $x = 1$.



Average rate of change of $f(x) = e^x$ from $x = 1$ to $x = 2$:

$$\begin{aligned} \text{Average r.o.c.} &= \frac{f(2) - f(1)}{2 - 1} \\ &= \frac{e^2 - e^1}{1} \\ &\approx 4.67077 \end{aligned}$$

Goal: Estimate the rate $f(x) = e^x$ changes at the point $x = 1$.



Average rate of change of $f(x) = e^x$ from $x = 1$ to $x = 1.5$:

$$\begin{aligned} \text{Average r.o.c.} &= \frac{f(1.5) - f(1)}{1.5 - 1} \\ &= \frac{e^{1.5} - e^1}{1} \\ &\approx 3.52681 \end{aligned}$$

Goal: Estimate the rate $f(x) = e^x$ changes at $x = 1$.

$x = 1$ to $x = ?$	Average rate of change	$x = ?$ to $x = 1$	Average rate of change
2	$\frac{e^2 - e^1}{2 - 1} \approx 4.6708$	0	$\frac{e^1 - e^0}{1 - 0} \approx 1.7183$
1.5	$\frac{e^{1.5} - e^1}{1.5 - 1} \approx 3.52681$	0.5	$\frac{e^1 - e^{0.5}}{1 - 0.5} \approx 2.13912$

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1.0001	$\frac{e^{1.0001} - e^1}{1.0001 - 1} \approx 2.7184$	0.9999	$\frac{e^1 - e^{0.9999}}{1 - 0.9999} \approx 2.7181$

Goal: Estimate the slope of the line tangent to

$$f(x) = e^x \text{ at } x = 1.$$

$x = 1$	Slope from $(1, e^1)$	$x = ?$	Slope from (x, e^x)
2	$\frac{e^2 - e^1}{2 - 1} \approx 4.6708$	0	$\frac{e^1 - e^0}{1 - 0} \approx 1.7183$
1.5	$\frac{e^{1.5} - e^1}{1.5 - 1} \approx 3.52681$	0.5	$\frac{e^1 - e^{0.5}}{1 - 0.5} \approx 2.13912$
1.1	$\frac{e^{1.1} - e^1}{1.1 - 1} \approx 2.8588$	0.9	$\frac{e^1 - e^{0.9}}{1 - 0.9} \approx 2.5868$
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1.001	$\frac{e^{1.001} - e^1}{1.001 - 1} \approx 2.7196$	0.999	$\frac{e^1 - e^{0.999}}{1 - 0.999} \approx 2.7169$
1.0001	$\frac{e^{1.0001} - e^1}{1.0001 - 1} \approx 2.7184$	0.9999	$\frac{e^1 - e^{0.9999}}{1 - 0.9999} \approx 2.7181$

Reading Question 1(b)

$$f(x) = x^2 + 1$$

$x = 2$ to $x = ?$	Slope from $(2, 5)$ to $(x, x^2 + 1)$	$x = ?$ to $x = 2$	Slope from $(x, x^2 + 1)$ to $(2, 5)$
3	$\frac{f(3) - 5}{3 - 2} \approx 5$	1	$\frac{5 - f(1)}{2 - 1} \approx 3$
2.1	$\frac{f(2.1) - 5}{2.1 - 2} \approx 4.1$	1.9	$\frac{5 - f(1.9)}{2 - 1.9} \approx 3.9$
2.01	$\frac{f(2.01) - 5}{2.01 - 2} \approx 4.01$	1.99	$\frac{5 - f(1.99)}{2 - 1.99} \approx 3.99$
2.001	$\frac{f(2.001) - 5}{2.001 - 2} \approx 4.001$	1.999	$\frac{5 - f(1.999)}{2 - 1.999} \approx 3.999$
2.0001	$\frac{f(2.0001) - 5}{2.0001 - 2} \approx 4.0001$	1.9999	$\frac{5 - f(1.9999)}{2 - 1.9999} \approx 3.9999$