Differentialkvotient for $f(x) = g(h(x))$

Differentialkvotient for $f(x) = g(h(x))$, hvor g og h er en differentiable funktioner.

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$$\frac{g(y_0 + \boldsymbol{k}) - g(y_0)}{\boldsymbol{k}} - g'(y_0) = v$$

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$$\frac{g(y_0 + \boldsymbol{k}) - g(y_0)}{\boldsymbol{k}} = v + g'(y_0)$$

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Trin 2: Reducer differenskvotienten.

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Trin 2: Reducer differenskvotienten.

$$\frac{g(h(x_0+\boldsymbol{h}))-g(h(x_0))}{\boldsymbol{h}} = \frac{g((w+h'(x_0))\cdot\boldsymbol{h}+h(x_0))-g(h(x_0))}{\boldsymbol{h}}$$

$$\lim_{\boldsymbol{k}\to 0}\frac{g(y_0+\boldsymbol{k})-g(y_0)}{\boldsymbol{k}} - g'(y_0) = 0$$

$$g(y_0+\boldsymbol{k}) = (v+g'(y_0))\cdot\boldsymbol{k}+g(y_0)$$

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$$\frac{g(h(x_0+\boldsymbol{h})) - g(h(x_0))}{\boldsymbol{h}} = \frac{g(h(x_0) + (w + h'(x_0))\cdot\boldsymbol{h}) - g(h(x_0))}{\boldsymbol{h}}$$

$$\begin{aligned}
\lim_{\boldsymbol{k}\to 0} \frac{g(y_0+\boldsymbol{k}) - g(y_0)}{\boldsymbol{k}} - g'(y_0) &= 0 \\
g(y_0+\boldsymbol{k}) &= (v + g'(y_0))\cdot\boldsymbol{k} + g(y_0) \\
h(x_0+\boldsymbol{h}) &= (w + h'(x_0))\cdot\boldsymbol{h} + h(x_0) \\
\boldsymbol{k} &= (w + h'(x_0))\cdot\boldsymbol{h}
\end{aligned}$$

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$$g(y_0+\boldsymbol{k}) = (v + g'(y_0)) \cdot \boldsymbol{k} + g(y_0)$$

$$h(x_0+\boldsymbol{h}) = (w + h'(x_0)) \cdot \boldsymbol{h} + h(x_0)$$

$$\boldsymbol{k} = (w + h'(x_0)) \cdot \boldsymbol{h}$$

$$\frac{g(h(x_0+\boldsymbol{h})) - g(h(x_0))}{\boldsymbol{h}} = \frac{(v + g'(h(x_0))) \cdot (w + h'(x_0)) \cdot \boldsymbol{h} + g(h(x_0)) - g(h(x_0))}{\boldsymbol{h}}$$

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$$(v + g'(h(x_0))) \cdot (w + h'(x_0))$$

Trin 3: Udregn grænseværdien.

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$$(v+g'(h(x_0)))\cdot(w+h'(x_0))$$

Trin 3: Udregn grænseværdien.

$$\lim_{\boldsymbol{h}\to 0}(v+g'(h(x_0)))\cdot(w+h'(x_0))$$

$$\lim_{\boldsymbol{k}\to 0}\frac{g(y_0+\boldsymbol{k})-g(y_0)}{\boldsymbol{k}}-g'(y_0) = 0$$

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$$(v + g'(h(x_0))) \cdot (w + h'(x_0))$$

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$$\lim_{\boldsymbol{h} \to 0} (v + g'(h(x_0))) \cdot (w + h'(x_0))$$

$$\lim_{\boldsymbol{k} \to 0} \frac{g(y_0 + \boldsymbol{k}) - g(y_0)}{\boldsymbol{k}} - g'(y_0) = 0$$

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Trin 2: Reducer differenskvotienten.

$$(v + g'(h(x_0))) \cdot (w + h'(x_0))$$

Trin 3: Udregn grænseværdien.

$$(\lim_{\boldsymbol{h}\to 0} v + \lim_{\boldsymbol{h}\to 0} g'(h(x_0))) \cdot (\lim_{\boldsymbol{h}\to 0} w + \lim_{\boldsymbol{h}\to 0} h'(x_0))$$

$$\lim_{\boldsymbol{k}\to 0} \frac{g(y_0 + \boldsymbol{k}) - g(y_0)}{\boldsymbol{k}} - g'(y_0) = 0$$

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Trin 2: Reducer differenskvotienten.

$$(v + g'(h(x_0))) \cdot (w + h'(x_0))$$

Trin 3: Udregn grænseværdien.

$$(\lim_{\boldsymbol{h}\to 0} v + g'(h(x_0))) \cdot (\lim_{\boldsymbol{h}\to 0} w + h'(x_0))$$

$$\lim_{\boldsymbol{k}\to 0} \frac{g(y_0+\boldsymbol{k}) - g(y_0)}{\boldsymbol{k}} - g'(y_0) = 0$$

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$$(v + g'(h(x_0))) \cdot (w + h'(x_0))$$

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$$(\lim_{\boldsymbol{h}\to 0} v + g'(h(x_0))) \cdot h'(x_0)$$

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$$(v+g'(h(x_0)))\cdot(w+h'(x_0))$$

Trin 3: Udregn grænseværdien.

$$g'(h(x_0))\cdot h'(x_0)$$

$$\lim_{\boldsymbol{k}\to 0}\frac{g(y_0+\boldsymbol{k})-g(y_0)}{\boldsymbol{k}} - g'(y_0) = 0$$

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Trin 2: Reducer differenskvotienten.

$$(v + g'(h(x_0))) \cdot (w + h'(x_0))$$

Trin 3: Udregn grænseværdien.

$$f'(x) = g'(h(x)) \cdot h'(x)$$

$$\lim_{\boldsymbol{k}\to 0} \frac{g(y_0+\boldsymbol{k}) - g(y_0)}{\boldsymbol{k}} - g'(y_0) = 0$$

$$\boldsymbol{k} = (w + h'(x_0)) \cdot \boldsymbol{h}$$

$$v = \frac{g(y_0+\boldsymbol{k}) - g(y_0)}{\boldsymbol{k}} - g'(y_0)$$

$$\lim_{\boldsymbol{h}\to 0} \frac{h(x_0+\boldsymbol{h}) - h(x_0)}{\boldsymbol{h}} - h'(x_0) = 0$$

$$w = \frac{h(x_0+\boldsymbol{h}) - h(x_0)}{\boldsymbol{h}} - h'(x_0)$$

Anvendelse af regneregler

Bestem f' for følgende funktioner.

$$f(x) = \sqrt{2x^2 + 4x}$$
$$f(x) = \ln(x^2 + 3)$$
$$f(x) = e^{x^2+1}$$

f	f'	
$g+h$	$g'+h'$	(10)
$k \cdot g(x)$	$k \cdot g'(x)$	(11)
$g \cdot h$	$g' \cdot h + g \cdot h'$	(12)
$\frac{1}{g}$	$-\frac{g'}{g^2}$	(13)
$\frac{h}{g}$	$\frac{h' \cdot g - h \cdot g'}{g^2}$	(14)
$g(h(x))$	$g'(h(x)) \cdot h'(x)$	(15)

f	f'	
k	0	(1)
$k \cdot x$	k	(2)
x^n	$n \cdot x^{n-1}$	(3)
$\frac{1}{x}$	$-\frac{1}{x^2}$	(4)
$\sqrt{x}$	$\frac{1}{2\sqrt{x}}$	(5)
e^x	e^x	(6)
$e^{k \cdot x}$	$k \cdot e^{k \cdot x}$	(7)
$\ln(x)$	$\frac{1}{x}$	(8)
a^x	$a^x \cdot \ln(a)$	(9)

Anvendelse af regneregler

Bestem f' for følgende funktioner.

$$f(x) = \sqrt{2x^2+4x} \Rightarrow f'(x) = \frac{1}{2\sqrt{2x^2+4x}} \cdot (4x+4)$$

$$f(x) = \ln(x^2+3)$$

$$f(x) = e^{x^2+1}$$

f	f'	
$g+h$	$g'+h'$	(10)
$k \cdot g(x)$	$k \cdot g'(x)$	(11)
$g \cdot h$	$g' \cdot h + g \cdot h'$	(12)
$\frac{1}{g}$	$-\frac{g'}{g^2}$	(13)
$\frac{h}{g}$	$\frac{h' \cdot g - h \cdot g'}{g^2}$	(14)
$g(h(x))$	$g'(h(x)) \cdot h'(x)$	(15)

f	f'	
k	0	(1)
$k \cdot x$	k	(2)
x^n	$n \cdot x^{n-1}$	(3)
$\frac{1}{x}$	$-\frac{1}{x^2}$	(4)
$\sqrt{x}$	$\frac{1}{2\sqrt{x}}$	(5)
e^x	e^x	(6)
$e^{k \cdot x}$	$k \cdot e^{k \cdot x}$	(7)
$\ln(x)$	$\frac{1}{x}$	(8)
a^x	$a^x \cdot \ln(a)$	(9)

Anvendelse af regneregler

Bestem f' for følgende funktioner.

$$f(x) = \sqrt{2x^2 + 4x} \Rightarrow f'(x) = \frac{(4x+4)}{2\sqrt{2x^2+4x}}$$

$$f(x) = \ln(x^2 + 3)$$

$$f(x) = e^{x^2+1}$$

f	f'	
$g + h$	$g' + h'$	(10)
$k \cdot g(x)$	$k \cdot g'(x)$	(11)
$g \cdot h$	$g' \cdot h + g \cdot h'$	(12)
$\frac{1}{g}$	$-\frac{g'}{g^2}$	(13)
$\frac{h}{g}$	$\frac{h' \cdot g - h \cdot g'}{g^2}$	(14)
$g(h(x))$	$g'(h(x)) \cdot h'(x)$	(15)

f	f'	
k	0	(1)
$k \cdot x$	k	(2)
x^n	$n \cdot x^{n-1}$	(3)
$\frac{1}{x}$	$-\frac{1}{x^2}$	(4)
$\sqrt{x}$	$\frac{1}{2\sqrt{x}}$	(5)
e^x	e^x	(6)
$e^{k \cdot x}$	$k \cdot e^{k \cdot x}$	(7)
$\ln(x)$	$\frac{1}{x}$	(8)
a^x	$a^x \cdot \ln(a)$	(9)

Anvendelse af regneregler

Bestem f' for følgende funktioner.

$$f(x) = \sqrt{2x^2 + 4x} \Rightarrow f'(x) = \frac{2(2x+2)}{2\sqrt{2x^2+4x}}$$

$$f(x) = \ln(x^2 + 3)$$

$$f(x) = e^{x^2+1}$$

f	f'	
$g + h$	$g' + h'$	(10)
$k \cdot g(x)$	$k \cdot g'(x)$	(11)
$g \cdot h$	$g' \cdot h + g \cdot h'$	(12)
$\frac{1}{g}$	$-\frac{g'}{g^2}$	(13)
$\frac{h}{g}$	$\frac{h' \cdot g - h \cdot g'}{g^2}$	(14)
$g(h(x))$	$g'(h(x)) \cdot h'(x)$	(15)

f	f'	
k	0	(1)
$k \cdot x$	k	(2)
x^n	$n \cdot x^{n-1}$	(3)
$\frac{1}{x}$	$-\frac{1}{x^2}$	(4)
$\sqrt{x}$	$\frac{1}{2\sqrt{x}}$	(5)
e^x	e^x	(6)
$e^{k \cdot x}$	$k \cdot e^{k \cdot x}$	(7)
$\ln(x)$	$\frac{1}{x}$	(8)
a^x	$a^x \cdot \ln(a)$	(9)

Anvendelse af regneregler

Bestem f' for følgende funktioner.

$$f(x) = \sqrt{2x^2+4x} \Rightarrow f'(x) = \frac{(2x+2)}{\sqrt{2x^2+4x}}$$

$$f(x) = \ln(x^2+3)$$

$$f(x) = e^{x^2+1}$$

f	f'	
$g+h$	$g'+h'$	(10)
$k \cdot g(x)$	$k \cdot g'(x)$	(11)
$g \cdot h$	$g' \cdot h + g \cdot h'$	(12)
$\frac{1}{g}$	$-\frac{g'}{g^2}$	(13)
$\frac{h}{g}$	$\frac{h' \cdot g - h \cdot g'}{g^2}$	(14)
$g(h(x))$	$g'(h(x)) \cdot h'(x)$	(15)

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k	0	(1)
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x^n	$n \cdot x^{n-1}$	(3)
$\frac{1}{x}$	$-\frac{1}{x^2}$	(4)
$\sqrt{x}$	$\frac{1}{2\sqrt{x}}$	(5)
e^x	e^x	(6)
$e^{k \cdot x}$	$k \cdot e^{k \cdot x}$	(7)
$\ln(x)$	$\frac{1}{x}$	(8)
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Anvendelse af regneregler

Bestem f' for følgende funktioner.

$$f(x) = \sqrt{2x^2+4x} \Rightarrow f'(x) = \frac{(2x+2)}{\sqrt{2x^2+4x}}$$

$$f(x) = \ln(x^2+3) \Rightarrow f'(x) = \frac{1}{x^2+3} \cdot 2x$$

$$f(x) = e^{x^2+1}$$

f	f'	
$g+h$	$g'+h'$	(10)
$k \cdot g(x)$	$k \cdot g'(x)$	(11)
$g \cdot h$	$g' \cdot h + g \cdot h'$	(12)
$\frac{1}{g}$	$-\frac{g'}{g^2}$	(13)
$\frac{h}{g}$	$\frac{h' \cdot g - h \cdot g'}{g^2}$	(14)
$g(h(x))$	$g'(h(x)) \cdot h'(x)$	(15)

f	f'	
k	0	(1)
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x^n	$n \cdot x^{n-1}$	(3)
$\frac{1}{x}$	$-\frac{1}{x^2}$	(4)
$\sqrt{x}$	$\frac{1}{2\sqrt{x}}$	(5)
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$\ln(x)$	$\frac{1}{x}$	(8)
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Anvendelse af regneregler

Bestem f' for følgende funktioner.

$$f(x) = \sqrt{2x^2+4x} \Rightarrow f'(x) = \frac{(2x+2)}{\sqrt{2x^2+4x}}$$

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$g+h$	$g'+h'$	(10)
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$\sqrt{x}$	$\frac{1}{2\sqrt{x}}$	(5)
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$\ln(x)$	$\frac{1}{x}$	(8)
a^x	$a^x \cdot \ln(a)$	(9)

Anvendelse af regneregler

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$$f(x) = \sqrt{2x^2+4x} \Rightarrow f'(x) = \frac{(2x+2)}{\sqrt{2x^2+4x}}$$

$$f(x) = \ln(x^2+3) \Rightarrow f'(x) = \frac{2x}{x^2+3}$$

$$f(x) = e^{x^2+1} \Rightarrow f'(x) = e^{x^2+1} \cdot 2x$$

f	f'	
$g+h$	$g'+h'$	(10)
$k \cdot g(x)$	$k \cdot g'(x)$	(11)
$g \cdot h$	$g' \cdot h + g \cdot h'$	(12)
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