

afgeleide rekenregels

www.karelappeltans.be

June 14, 2021

1 Afgeleide machtsfunctie

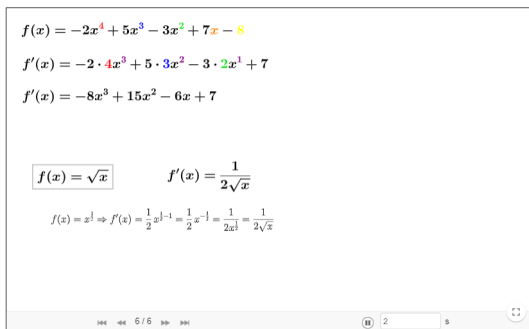


Figure 1: <https://www.geogebra.org/m/rkbXbnRv>

$$\boxed{(x^n)' = nx^{n-1}}$$

2 Afgeleide rationale functies

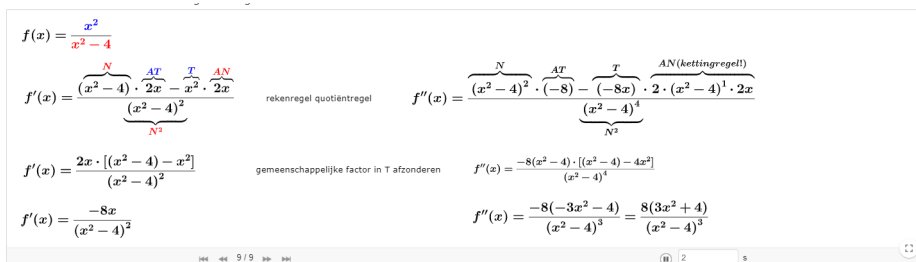


Figure 2: <https://www.geogebra.org/m/MpFEGPft>

$$\boxed{\left(\frac{T}{N}\right)' = \frac{NAT - T \cdot AN}{N^2}}$$

3 Afgeleide irrationale functies

$$\boxed{(\sqrt{x})' = \frac{1}{2\sqrt{x}}}$$

4 Afgeleide goniometrische functies

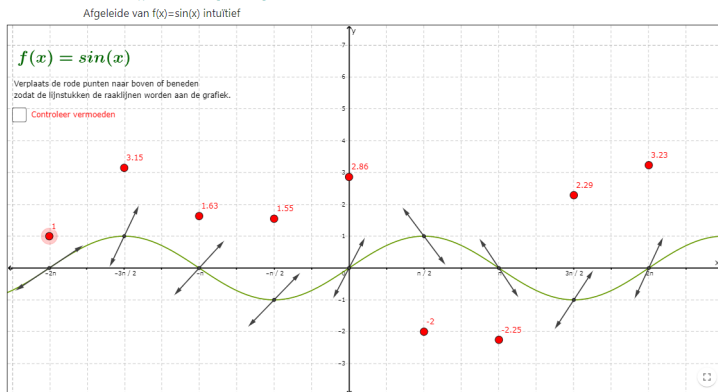


Figure 3: <https://www.geogebra.org/m/qkq5rdwr>

$$(\sin(x))' = \cos(x)$$

$$(\cos(x))' = -\sin(x)$$

$$(\tan(x))' = \frac{1}{\cos^2(x)}$$

5 Algemene rekenregels

5.1 De somregel

$$(a \cdot f(x) + b \cdot g(x))' = a \cdot f'(x) + b \cdot g'(x)$$

$$(3\sin(x) + 5\sqrt{x})' = 3\cos(x) + \frac{5}{2\sqrt{x}}$$

5.2 De productregel

TB: $(f \cdot g)' = f' \cdot g + f \cdot g'$

Bewijs: $(f \cdot g)'(a) = \lim_{x \rightarrow a} \frac{(f \cdot g)(x) - (f \cdot g)(a)}{x - a}$

$$(f \cdot g)'(a) = \lim_{x \rightarrow a} \frac{f(x) \cdot g(x) - f(a) \cdot g(a)}{x - a}$$

$$(f \cdot g)'(a) = \lim_{x \rightarrow a} \frac{f(x) \cdot g(x) - f(a) \cdot g(x) + f(a) \cdot g(x) - f(a) \cdot g(a)}{x - a}$$

$$(f \cdot g)'(a) = \lim_{x \rightarrow a} \frac{(f(x) - f(a))g(x) + f(a) \cdot (g(x) - g(a))}{x - a}$$

$$(f \cdot g)'(a) = \lim_{x \rightarrow a} \left[\frac{f(x) - f(a)}{x - a} \cdot g(x) + f(a) \cdot \frac{g(x) - g(a)}{x - a} \right]$$

$$(f \cdot g)'(a) = \lim_{x \rightarrow a} \left[\frac{f(x) - f(a)}{x - a} \right] \lim_{x \rightarrow a} g(x) + \lim_{x \rightarrow a} f(a) \cdot \lim_{x \rightarrow a} \left[\frac{g(x) - g(a)}{x - a} \right]$$

$$(f \cdot g)'(a) = f'(a) \cdot g(a) + f(a) \cdot g'(a)$$

Figure 4: <https://www.geogebra.org/m/yvrncth8>

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

$$(x^2 \cdot \cos(x))' = 2x \cdot \cos(x) + x^2 \cdot (-\sin(x))$$

5.3 De quotiëntregel

$TB: \left(\frac{1}{f}\right)' = \frac{-f'}{f^2}$
Bewijs: $\left(\frac{1}{f(a)}\right)' = \lim_{x \rightarrow a} \frac{\frac{1}{f(x)} - \frac{1}{f(a)}}{x - a}$
 $= \lim_{x \rightarrow a} \frac{\frac{f(a) - f(x)}{f(x) \cdot f(a)}}{x - a}$
 $= \lim_{x \rightarrow a} \frac{f(a) - f(x)}{f(x) \cdot f(a)} \cdot \frac{1}{x - a}$
 $= \lim_{x \rightarrow a} \frac{1}{f(x) \cdot f(a)} \cdot \frac{-(f(x) - f(a))}{x - a}$
 $= - \lim_{x \rightarrow a} \frac{1}{f(x) \cdot f(a)} \cdot \lim_{x \rightarrow a} \frac{f(x) - f(a)}{x - a}$
 $= \frac{-1}{f(a)^2} \cdot f'(a)$

Figure 5: <https://www.geogebra.org/m/yvrncth8>

$$\boxed{\left(\frac{1}{f(x)}\right)' = \frac{-f'(x)}{f(x)^2}}$$

$$\left(\frac{1}{\sin(x)}\right)' = \frac{-\cos(x)}{\sin^2(x)}$$

$TB: \left(\frac{f}{g}\right)' = \frac{g \cdot f' - f \cdot g'}{g^2}$
Bewijs: $\left(\frac{f}{g}\right)' = \left(f \cdot \frac{1}{g}\right)'$
 $\left(\frac{f}{g}\right)' = f' \cdot \left(\frac{1}{g}\right) + f \cdot \left(\frac{1}{g}\right)'$
 $\left(\frac{f}{g}\right)' = f' \cdot \left(\frac{1}{g}\right) + f \cdot \left(\frac{-g'}{g^2}\right)$
 $\left(\frac{f}{g}\right)' = \frac{g \cdot f' - f \cdot g'}{g^2}$

Figure 6: <https://www.geogebra.org/m/yvrncth8>

$$\boxed{\left(\frac{f(x)}{g(x)}\right)' = \frac{g(x) \cdot f'(x) - f(x) \cdot g'(x)}{g(x)^2}}$$

$$\left(\frac{2x^3 + 4x^2 + 1}{\sin(x)}\right)' = \frac{\sin(x) \cdot (6x^2 + 8x) - (2x^3 + 4x^2 + 1) \cdot \cos(x)}{\sin^2(x)}$$

5.4 De kettingregel

Afgeleide samengestelde functies:

$f(x) = \sqrt{x}$ $g(x) = \sin(x)$ $f \circ g(x) = \sqrt{\sin(x)}$

$f \circ g(x) : x \xrightarrow{g(x)} \boxed{\sin(x)} \xrightarrow{f(\square)=\sqrt{\square}} \sqrt{\boxed{\sin(x)}}$

$g'(x) = \cos(x)$ $f'(\square) = \frac{1}{2\sqrt{\square}} \Rightarrow f'(g(x)) = f'(\sin(x)) = \frac{1}{2\sqrt{\sin(x)}}$

$f \circ g'(x) = f'(g(x)) \cdot g'(x) = \frac{1}{2\sqrt{\sin(x)}} \cdot \cos(x) = \frac{\cos(x)}{2\sqrt{\sin(x)}}$

Figure 7: <https://www.geogebra.org/m/YN8wHwSh>

$$\boxed{(f(g(x)))' = f'(g(x)) \cdot g'(x)}$$

$$(\sin(x^2 + 3))' = \cos(x^2 + 3) \cdot 2x$$

5.5 Afgeleide inverse functie

Afgeleide inverse functie

Voorbeeld:

$f(x) = x^3 \Rightarrow f^{-1}(x) = \sqrt[3]{x}$

$x \xrightarrow{f^{-1}} \sqrt[3]{x} \xrightarrow{f} x \Rightarrow f(f^{-1}(x)) = x$

$\Rightarrow (f(f^{-1}(x)))' = x'$

beide leden afleiden, LL: kettingregel $f'(f^{-1}(x)) \cdot f^{-1}'(x) = 1 \Rightarrow f^{-1}'(x) = \frac{1}{f'(f^{-1}(x))}$

$(\sqrt[3]{x})' = \frac{1}{3(\sqrt[3]{x})^2}$

$f(\square) = \square^3 \Rightarrow f'(\square) = 3 \cdot \square^2$

$(\sqrt[3]{x})' = \frac{1}{3 \cdot \sqrt[3]{x^2}}$

Figure 8: <https://www.geogebra.org/m/hwzhaqsb>

$$\boxed{(f^{-1}(x))' = \frac{1}{f'(f^{-1}(x))}}$$

$$(\sqrt[3]{x})' = \frac{1}{3(\sqrt[3]{x})^2} = \frac{1}{3(\sqrt[3]{x^2})}$$

6 Overzicht rekenregels

$$(af + bg)'(x) = a f'(x) + b g'(x) \quad (a, b \in \mathbb{R})$$

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

$$(f^r)'(x) = r f^{r-1}(x) \cdot f'(x) \quad (r \in \mathbb{R})$$

$$\left(\frac{1}{f}\right)' = \frac{-f'(x)}{f(x)^2}$$

$$\left(\frac{f}{g}\right)'(x) = \frac{f'(x) \cdot g(x) - f(x) \cdot g'(x)}{g(x)^2}$$

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

$$(f^{-1}(x))' = \frac{1}{f'(f^{-1}(x))}$$

$$\vdots$$

$$(\square + \Delta)' = \square' + \Delta'$$

$$(\square \cdot \Delta)' = \square' \cdot \Delta + \square \cdot \Delta'$$

$$(\square^r)' = r \square^{r-1} \cdot \square'$$

$$\left(\frac{1}{\square}\right)' = \frac{-\square'}{\square^2}$$

$$\left(\frac{\square}{\Delta}\right)' = \frac{\square' \cdot \Delta - \square \cdot \Delta'}{\Delta^2}$$

:

$f(x) = c$ ($c \in \mathbb{R}$)	$f'(x) = 0$	
$f(x) = x$	$f'(x) = 1$	
$f(x) = x^r$ ($r \in \mathbb{R}$)	$f'(x) = r x^{r-1}$	$(\square^r)' = r \cdot \square^{r-1} \cdot \square'$
$f(x) = \sqrt{x}$	$f'(x) = \frac{1}{2\sqrt{x}}$	$(\sqrt{\square})' = \frac{1}{2\sqrt{\square}} \cdot \square'$
$f(x) = e^x$	$f'(x) = e^x$	$(e^{\square})' = e^{\square} \cdot \square'$
$f(x) = a^x$ ($a \in \mathbb{R}_0^+ \setminus \{1\}$)	$f'(x) = a^x \ln a$	$(a^{\square})' = a^{\square} \ln a \cdot \square'$
$f(x) = \ln x$	$f'(x) = \frac{1}{x}$	$(\ln \square)' = \frac{1}{\square} \cdot \square'$
$f(x) = \log_a x$	$f'(x) = \frac{1}{x \ln a}$	$(\log_a \square)' = \frac{1}{\square \ln a} \cdot \square'$
$f(x) = \sin x$	$f'(x) = \cos x$	$(\sin \square)' = \cos \square \cdot \square'$
$f(x) = \cos x$	$f'(x) = -\sin x$	$(\cos \square)' = -\sin \square \cdot \square'$
$f(x) = \tan x$	$f'(x) = \frac{1}{\cos^2 x}$	$(\tan \square)' = \frac{1}{\cos^2 \square} \cdot \square'$
$f(x) = \cot x$	$f'(x) = \frac{-1}{\sin^2 x}$	$(\cot \square)' = \frac{-1}{\sin^2 \square} \cdot \square'$
$f(x) = \arcsin x$	$f'(x) = \frac{1}{\sqrt{1-x^2}}$	$(\arcsin \square)' = \frac{1}{\sqrt{1-\square^2}} \cdot \square'$
$f(x) = \arccos x$	$f'(x) = \frac{-1}{\sqrt{1-x^2}}$	$(\arccos \square)' = \frac{-1}{\sqrt{1-\square^2}} \cdot \square'$
$f(x) = \arctan x$	$f'(x) = \frac{1}{1+x^2}$	$(\arctan \square)' = \frac{1}{1+\square^2} \cdot \square'$
$f(x) = \operatorname{arc cot} x$	$f'(x) = \frac{-1}{1+x^2}$	$(\operatorname{arc cot} \square)' = \frac{-1}{1+\square^2} \cdot \square'$

7 Oefeningen

- Op deze site kunnen alle oefeningen gecontroleerd worden: <https://www.derivative-calculator.net/>
- afgeleide samengestelde functies: <https://www.geogebra.org/m/YN8wHwSh>
- Bereken de afgeleide van onderstaande functies

(a) $f(t) = (1+t) \ln t$

(b) $f(t) = t^2 \cos t$

(c) $f(t) = \frac{-1}{t^2}$

(d) $f(t) = \frac{3t-1}{2t+2}$

(e) $f(x) = \sin(4x+5)$

(f) $f(t) = \ln(7t^2)$

(g) $f(x) = \frac{4x^3+1}{3x}$

(h) $f(x) = \tan \frac{1}{x}$

(i) $f(x) = \cos(-8x^2-1)$

(j) $f(x) = \sin^3(3x)$

(k) $f(x) = \sqrt{x^2-7x+8}$

(l) $f(t) = \ln t \sin(t^2)$

(m) $f(t) = \ln(1-t^2)$

- Bereken de afgeleide van onderstaande functies

(a) $r(\theta) = 2\theta^{1/2} + \frac{3}{2}\theta^{2/3} + \frac{4}{3}\theta^{3/4}$

(b) $r(\theta) = \frac{4}{1+2\cos\theta}$

(c) $r(\theta) = \sqrt{1-2\theta}$

(d) $r(\theta) = \frac{a}{\theta}$ met $a > 0$.

- Bereken de afgeleide van de volgende functies

(a) $f(x) = \sin(\sqrt[3]{x^2})$

(b) $f(x) = \cos^3(x^3) + (x^3-3)^3$

(c) $f(x) = \frac{\sin^2(4x-1)}{x^2+3x+5}$

- alle rekenregels door elkaar:

(a) <https://homepages.bluffton.edu/~nesterd/apps/derivs.html>

(b) <https://www.math-exercises.com/limits-derivatives-integrals/derivative-of-a-function>

7. Bepaal de waarden van $n \in \mathbb{Z}$ zodat $y = x^n$ een oplossing is van volgende (differentiaal)vergelijking: $x^2 y'' - 2xy' = 4y$ (A: $n=4$ en $n=-1$)

8. Bepaal m.b.v. $f(x) = (2x + 1)^{\frac{3}{2}}$ een lineaire benadering voor $83^{\frac{3}{2}}$. (A. 756)

9. Bereken de gevraagde afgeleide m.b.v. onderstaande tabel

Use the following table to answer question questions # 9 and # 10.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
1	2	1	3	2
2	2	2	1	3
3	3	1	3	1

9. If $h(x) = f(g(x))$, what is $h'(1)$?

10. If $H(x) = g(f(x))$, what is $H'(3)$?

10. Bereken de gevraagde afgeleide m.b.v. onderstaande tabel

t	0	1	2	3	4
$h(t)$	-2	2	3	4	8
$h'(t)$	3.5	0.5	2.5	1.5	5
$h''(t)$	6	0.25	0.3	-0.4	0.6

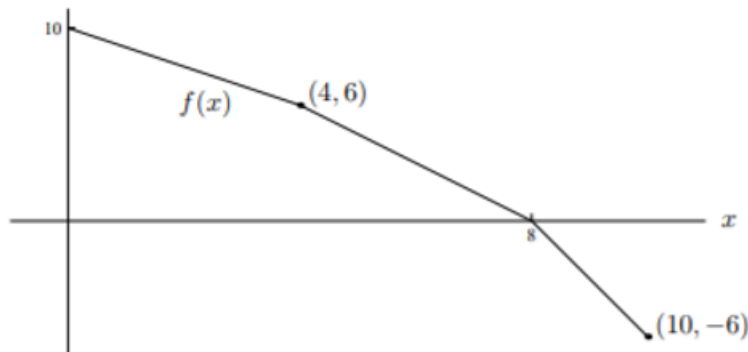
(a) $a(t) = h(t^2 - 1)$ gevraagd $a'(3)$

(b) $b(t) = \frac{h(t)}{t^2}$ gevraagd $b'(4)$

(c) $c(t) = h^{-1}(t)$ gevraagd $c'(2)$

11. Bepaal $g'(3)$ als

Consider the piecewise linear function $f(x)$ graphed below:



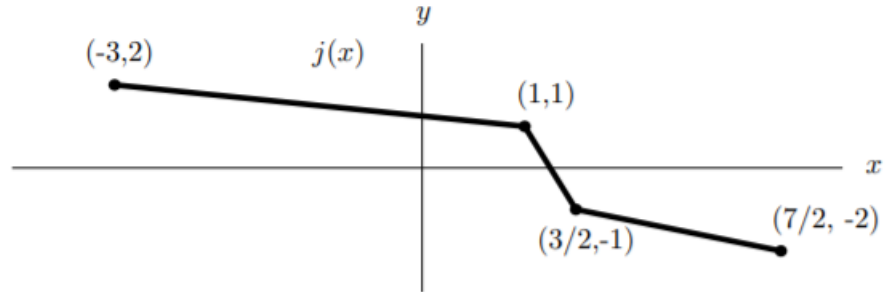
(a) $g(x) = \frac{f(x^2)}{x}$ (antw. $-\frac{51}{9}$)

(b) $g(x) = \sin(f(x)^3)$ (antw. $-147\cos(343)$)

(c) $g(x) = f^{-1}(x)$ (antw. $-\frac{2}{3}$)

12. Bereken de gevraagde afgeleiden

[15 points] The graph of a piecewise linear function $j(x)$ is given below. Use it to select the correct value of each derivative below. Circle only one answer for each part. Ambiguous marks will receive no credit.



a. [3 points] $\frac{d}{dx}[j(4 \cos x)]$ at $x = \frac{\pi}{4}$.

- (A) $-1/2$
- (B) $\sqrt{2}$
- (C) $-\sqrt{2}/2$
- (D) $-\sqrt{2}$

b. [3 points] $\frac{d}{dx}[j(j(x))]$ at $x = 2$.

- (A) $1/4$
- (B) $1/8$
- (C) $-1/4$
- (D) $-1/8$

8 Taken

1. taak rekenregels
2. taak kettingregel

Practice Problems on Derivative Computing (with Solutions)

This problem set is generated by Di. All of the problems came from past exams of Math 221. For derivative computing – unlike many of other math concepts – more lectures do not help much, and nothing compares to practicing on one’s own! The idea of this problem set is to get enough practice, till the point that it becomes hard to make any mistake. :)

1. $y = \sqrt[3]{x^2} \sin x$
2. $y = \frac{\tan x}{x^3+2}$
3. $y = (x^4 + \sin x \cos x)^3$
4. $y = \frac{x^3-2x}{x+3}$
5. $y = (\sqrt{x^2-1} + 1)^{10}$
6. $y = \cos(x^2) \tan(\sqrt{x+1})$
7. $y = \cos(\cos(\cos(3x)))$
8. $y = \sqrt{\frac{1+x}{2-x}}$
9. $y = x^2(\sqrt{x} + 2)$
10. $f(x) = 2\sqrt{x^2+1} + \sin\left(\frac{4\pi}{5}\right)$
11. $h(x) = \frac{\sin x}{2x-3}$
12. $y = x^3 + \frac{1}{2x^3} - \frac{2}{\sqrt[3]{x}}$
13. $y = \sin(5x) \cos(3x)$
14. $y = (\cos(x^2) + \cos^2 x)^4$
15. $y = 12 + x \cos x + x^5$
16. $y = (x^2 + x - 1) \sin x \cos^2 x$
17. $y = \cos\left(x^2 + \frac{x}{x+1}\right)$
18. $y = \frac{x^2-2}{x^4+1}$
19. $y = x^2 \sqrt[3]{\tan x}$
20. $y = (\sqrt{x^2+1} + x)^5$
21. $y = \sqrt{1-\cos x} (\tan x)^3$
22. $y = \frac{\sin(x^3)}{\sin(x^2)}$
23. $y = x^3 + \sin(x) \cos^2(x)$

24. $y = x(10x + 6)^{2011}$
25. $y = \sqrt{(\sin x)^3 + 1}$
26. $y = \tan(x^4 + 3x^2 + 1)$
27. $y = \frac{\sin(3x)}{1+x^4}$
28. $y = (5 - 2 \cos x)^{\frac{3}{2}}$
29. $y = (5\sqrt{x} + 3)^{80}$
30. $y = \frac{1}{x} \sin^{-4}(x) - \frac{x}{3} \cos^3(x)$
31. $y = \frac{\tan(2x)}{(x+5)^4}$
32. $y = \tan\left(\frac{\cos(x)}{x}\right)$
33. $y = \sin\left(\frac{x}{\sqrt{x^2+1}}\right)$
34. $y = \sin^5(3x^4 - 7x)$

The following problems involve e^x and $\ln x$, which we haven't seen in our lecture so far, but we will learn them later. We could practice them later when the material is covered. To do them, you need to know:

$$(e^x)' = e^x, (\ln x)' = \frac{1}{x}, \frac{d \arctan x}{dx} = \frac{1}{1+x^2}.$$

1. $f(x) = x \ln(e^{2x} + 2)$
2. $y = \arctan(e^{4x} + 3x)$
3. $y = \ln(x + \sqrt{x^2 - 1})$
4. $y = 3 \ln(x \sin x)$
5. $y = e^{-\tan(x+1)}$
6. $y = \sin(\ln x + 3x^2)$
7. $y = \frac{e^{x^2}}{x+3}$
8. $y = \sqrt{\ln x + 1}$
9. $y = e^{\sqrt{x^2+1}}$
10. $y = \ln\left(\frac{2(1+x^2)}{x^4}\right)$
11. $y = \ln e^{2x}$
12. $y = \arctan(x - 1) + \sqrt{\sin(\ln x)}$
13. $y = x^2 e^{3x^2-5x}$
14. $y = \ln(4x + 6) e^{5x}$

Solutions:

1. $y = x^{\frac{3}{2}} \sin x$
 $y' = \frac{3}{2}x^{\frac{1}{2}} \sin x + x^{\frac{3}{2}} \cos x$
2. $y' = \frac{\sec^2 x(x^3+2) - 3x^2 \tan x}{(x^3+2)^2}$
3. $y' = 3(x^4 + \sin x \cos x)^2 (4x^3 + \cos^2 x - \sin^2 x)$
4. $y' = \frac{(3x^2-2)(x+3) - (x^3-2x)}{(x+3)^2}$
5. $y = \left((x^2 - 1)^{\frac{1}{2}} + 1\right)^{10}$
 $y' = 10 \left(\sqrt{x^2 - 1} + 1\right)^9 \frac{1}{2} (x^2 - 1)^{-\frac{1}{2}} 2x$
6. $y' = -\sin(x^2) 2x \tan(\sqrt{x+1}) + \cos(x^2) \sec^2(\sqrt{x+1}) \frac{1}{2} (x+1)^{-\frac{1}{2}}$
7. $y' = -\sin(\cos(\cos(3x))) \cdot (-\sin(\cos(3x))) \cdot (-\sin(3x)) \cdot 3$
8. $y = \left(\frac{1+x}{2-x}\right)^{\frac{1}{2}}$
 $y' = \frac{1}{2} \left(\frac{1+x}{2-x}\right)^{-\frac{1}{2}} \frac{(2-x)+(1+x)}{(2-x)^2} = \frac{1}{2} \left(\frac{1+x}{2-x}\right)^{-\frac{1}{2}} \frac{3}{(2-x)^2}$
9. $y = x^2 \left(x^{\frac{1}{2}} + 2\right)$
 $y' = 2x \left(x^{\frac{1}{2}} + 2\right) + x^2 \left(\frac{1}{2}x^{-\frac{1}{2}}\right)$
10. $f(x) = 2(x^2 + 1)^{\frac{1}{2}} + \sin\left(\frac{4\pi}{5}\right)$ tricky question! notice $\sin\left(\frac{4\pi}{5}\right)$ is just a constant.
 $f'(x) = (x^2 + 1)^{-\frac{1}{2}} 2x$
11. $h'(x) = \frac{\cos x(2x-3) - 2 \sin x}{(2x-3)^2}$
12. $y = x^3 + \frac{1}{2}x^{-3} - 2x^{-\frac{1}{3}}$
 $y' = 3x^2 - \frac{3}{2}x^{-4} + \frac{2}{3}x^{-\frac{4}{3}}$
13. $y' = 5 \cos(5x) \cos(3x) + \sin(5x) (-\sin(3x)) 3$
14. $y' = 4(\cos(x^2) + \cos^2 x)^3 (-\sin(x^2) 2x + 2 \cos x (-\sin x))$
15. $y' = \cos x + x(-\sin x) + 5x^4$
16. This problem is the product rule of 3 functions. Just kill each of them at one time. $(abc)' = a'bc + ab'c + abc'$.
 $y' = (2x + 1) \sin x \cos^2 x + (x^2 + x - 1) \cos^3 x + (x^2 + x - 1) \sin x 2 \cos x (-\sin x)$
17. $y' = -\sin\left(x^2 + \frac{x}{x+1}\right) \left(2x + \frac{x+1-x}{(x+1)^2}\right) = -\sin\left(x^2 + \frac{x}{x+1}\right) \left(2x + \frac{1}{(x+1)^2}\right)$
18. $y' = \frac{2x(x^4+1) - 4x^3(x^2-2)}{(x^4+1)^2}$

19. $y = x^2 (\tan x)^{\frac{1}{3}}$
 $y' = 2x (\tan x)^{\frac{1}{3}} + x^2 \frac{1}{3} (\tan x)^{-\frac{2}{3}} \sec^2 x$
20. $y' = 5 \left(\sqrt{x^2 + 1} + x \right)^4 \left(\frac{1}{2} (x^2 + 1)^{-\frac{1}{2}} 2x + 1 \right)$
21. $y = (1 - \cos x)^{\frac{1}{2}} (\tan x)^3$
 $y' = \frac{1}{2} (1 - \cos x)^{-\frac{1}{2}} \sin x (\tan x)^3 + (1 - \cos x)^{\frac{1}{2}} 3 (\tan x)^2 \sec^2 x$
22. $y' = \frac{\cos(x^3)3x^2 \sin(x^2) - \cos(x^2)2x \sin(x^3)}{[\sin(x^2)]^2}$
23. $y' = 3x^2 + \cos^3 x + \sin x \cdot 2 \cos x (-\sin x)$
24. $y' = (10x + 6)^{2011} + x^{2011} (10x + 6)^{2010} 10$
25. $y = \left((\sin x)^3 + 1 \right)^{\frac{1}{2}}$
 $y' = \frac{1}{2} \left((\sin x)^3 + 1 \right)^{-\frac{1}{2}} 3 (\sin x)^2 \cos x$
26. $y' = \sec^2 (x^4 + 3x^2 + 1) (4x^3 + 6x)$
27. $y' = \frac{\cos(3x)3(1+x^4) - 4x^3 \sin(3x)}{(1+x^4)^2}$
28. $y' = \frac{3}{2} (5 - 2 \cos x)^{\frac{1}{2}} (2 \sin x)$
29. $y' = 80 (5\sqrt{x} + 3)^{79} \left(\frac{5}{2} x^{-\frac{1}{2}} \right)$
30. For the 1st term, you can also do quotient rule. Here I rewrite it as a product, so that I can kill people. :)
 $y = x^{-1} \sin^{-4} (x) - \frac{x}{3} \cos^3 x$
 $y' = -x^{-2} \sin^{-4} (x) + x^{-1} (-4) \sin^{-5} (x) \cos (x) - \frac{1}{3} \cos^3 x - \frac{x}{3} 3 \cos^2 x (-\sin x)$
31. $y' = \frac{\sec^2(2x)2(x+5)^4 - 4(x+5)^3 \tan(2x)}{(x+5)^8}$
32. $y' = \sec^2 \left(\frac{\cos x}{x} \right) - \frac{\sin x \cdot x - \cos x}{x^2}$
33. $y' = \cos \left(\frac{x}{\sqrt{x^2+1}} \right) \frac{\sqrt{x^2+1} - \frac{1}{2}(x^2+1)^{-\frac{1}{2}} 2x^2}{x^2+1}$
34. $y' = 5 \sin^4 (3x^4 - 7x) (12x^3 - 7)$

Well, I guess no one works till the last problem together with me... I admit computing derivatives could be pretty boring and exhausted. But if you finished all of these problems, I believe derivative computing will become part of your nature, and you can do them quickly and accurately. Now it's time to say: I came, I calculated, I conquered. :)

Some irrelevant aside by Di: *Typing solutions is also very exhausted! Half way through typing, I started to question myself why do I want to torture myself on doing this extra amount of work.*