(62)

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
2	8	2	$\frac{1}{3}$	-3
3	3	-4	2π	5

(a) $2/3$

$2f(x)$ @ $x=2$

$2 \cdot \frac{1}{3}$

$2 \cdot f'(x)$

(b) $2\pi+5$

$f(x)+g(x)$ @ $x=3$

$f'(x)+g'(x)$

$2\pi+5$

(c) $15-8\pi$

$f(x)\cdot g(x)$ @ $x=3$

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

$3\cdot 5+(-4)\cdot 2\pi$

$15-8\pi$

(d) $\frac{37}{6}$

$f(x)/g(x)$ @ $x=2$

$$\frac{g(x)f'(x)-f(x)g'(x)}{(g(x))^2}$$

$$\frac{\frac{2}{3}-(8\cdot -3)}{(-4)^2}$$

(e) -1 $f(g(x))$ @ $x=2$

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

$f'(2)\cdot -3$

$3\cdot -3$

-1

(f) $\frac{1}{12\sqrt{2}}$

$\sqrt{f(x)}$ @ $x=2$

$f(x)^{1/2}$

$\frac{1}{2}f(x)^{-1/2}$ $\quad \frac{1}{2\sqrt{f(x)}}=\frac{1}{2\sqrt{8}}=\frac{1}{4\sqrt{2}}$

(g) $\frac{5}{32}$

$\frac{1}{g^2(x)}$ @ $x=3$

$g^{-2}(x)$

$-2(g(x))^{-3}\cdot g'(x)$

$\frac{-2\cdot 5}{-64}=\frac{1\cdot 5}{32}$ $\quad \frac{5}{32}$

(h) $\frac{-5}{3\sqrt{17}}$

$\sqrt{f^2(x)+g^2(x)}$ @ $x=2$

$\sqrt{u}=u^{1/2}$

$\frac{1}{2}u^{-1/2}\cdot u'$

$\frac{1}{2}((f(x))^2+(g(x))^2)^{-1/2}\cdot[2f(x)\cdot f'(x)+2g(x)\cdot g'$

$$\frac{\frac{1}{2}[2f(x)\cdot f'(x)+2g(x)\cdot g'(x)]}{[(f(x))^2+(g(x))^2]^{1/2}}$$

$$\frac{\frac{1}{2}[\frac{16}{3}+-12]}{\sqrt{64}+\sqrt{16}}$$

$$\frac{-2u^2u'+2u'}{(u^2+1)^2}$$

$u = g(x) = 10x^2+x+1$, $x=0$

$g'(x) = 20x+1$

Vn-efficient $\rightsquigarrow$ $\dfrac{-2(10x^2+x+1)^2(20x+1)+2(20x+1)}{((10x^2+x+1)^2+1)^2}$

$g(0)=1$

$g'(0)=1$

$$= \frac{-2(1)(1)+2(1)}{(1+1)^2}$$

$$= \frac{-2+2}{2}$$

$$= 0$$

59, 62

Line tan and norm $y = 2\tan(\pi x/4)$ @ $x=1$

$y(1) = 2\tan(\frac{\pi}{4})$

$= 2(1)$

$= 2$

$T(x) = \pi(x-1)+2$

$N(x) = -\frac{1}{\pi}(x-1)+2$

$y' = 2\sec^2(\frac{\pi x}{4}) \cdot \frac{\pi}{4}$

$= \frac{\pi}{2}\sec^2(\frac{\pi x}{4})$

$y'(1) = \frac{\pi}{2}\sec^2(\frac{\pi}{4})$

$= \frac{\pi}{2} \cdot \left(\frac{1}{\cos(\frac{\pi}{4})}\right)^2$

$= \frac{\pi}{2} \cdot \left(\frac{1}{\frac{\sqrt{2}}{2}}\right)^2$

$= \frac{\pi}{2} \cdot \left(\frac{2\sqrt{2}}{2}\right)^2$

$= \pi$

$\frac{1}{\frac{\sqrt{2}}{2}} \cdot \frac{2}{2} = \frac{2}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} \quad \frac{2\sqrt{2}}{2}$

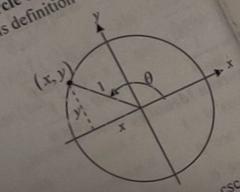
Trig Cheat Sheet

Definition of the Trig Functions

Right triangle definition
For this definition we assume that
$0<\theta<\frac{\pi}{2}$ or $0°<\theta<90°$.

hypotenuse

Unit circle definition
For this definition θ is any angle.



$\csc\theta = \frac{1}{y}$

16, 18, 20, 37, 59, 62

$\frac{x^1}{x^{1/2}} = x^{1-1/2}$

16.) $y = x^3(2x-5)^4$

$y' = x^3 \cdot 4(2x-5)^3 \cdot 2 + (2x-5)^4 \cdot 3x^2$

$= 8x^3(2x-5)^3 + 3x^2(2x-5)^4$

or $= x^2(2x-5)^3[8x+3(2x-4)]$

$\boxed{\text{Best} = x^2(2x-5)^3(14x-15)}$

18.) $y = 4\sqrt{\sec x + \tan x}$

$\cancel{= 4\sec^{1/2}x + 4\tan^{1/2}x}$

$\cancel{y' = 4\cdot\frac{1}{2}\sec^{-1/2}x + 4\frac{1}{2}\tan^{-1/2}x}$

$\cancel{= 2\sec^{-1/2}x + 2\tan^{-1/2}x}$

$\cancel{= 2}$

$\sqrt{a+b} \neq \sqrt{a} + \sqrt{b}$

$4u^{1/2}$

$y = 4(\sec x + \tan x)^{1/2}$

$y' = 4\cdot\frac{1}{2}(\sec x + \tan x)^{-1/2}(\sec x\cdot\tan x + \sec^2 x)$

$= \frac{2(\sec x\cdot\tan x + \sec^2 x)}{\sqrt{\sec x + \tan x}}$ or $= \frac{2\sec x(\tan x + \sec x)}{\sqrt{\sec x + \tan x}}$

or $= \boxed{2\sec x\sqrt{\sec x + \tan x}}$

20.) $y = \frac{x}{\sqrt{1+x^2}}$

$y = \cancel{x(1+x^2)}$

$= x(1+x^2)^{-1/2}$

$y' = x\cdot -\frac{1}{2}(1+x^2)^{-3/2}\cdot 2x + (1+x^2)^{1/2}\cdot 1$

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

37.) $f(u) = \frac{2u}{u^2+1}$, $u = g(x) = 10x^2 + x + 1$, $x = 0$

$f(u) = \frac{2(10x^2+x+1)}{(10x^2+x+1)+1}$ $x = 0$

$f'(u) = \frac{(u^2+1)(2u)' - 2u\cdot 2uu'}{(u^2+1)^2} = \frac{2u^2u' + 2u' - 4u^2u'}{(u^2+1)^2} = \frac{-2u^2u' + 2u'}{(u^2+1)^2}$