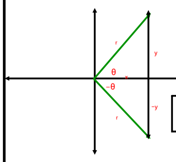
Negative Angles



$\sin\theta = \frac{y}{r}$ $\cos(\theta) = \frac{x}{r}$

$\sin(-\theta) = -\frac{y}{r}$ $\cos(-\theta) = \frac{x}{r}$

$\boxed{\sin(-\theta) = -\sin\theta}$ $\boxed{\cos(-\theta) = \cos\theta}$

Ex: 7.2

① a) $y = \cos(-4x)$

$y' = -\sin(-4x) \cdot -4$

$y' = 4\sin(-4x)$

$y' = -4\sin(4x)$

Ex: 7.3

① d) $y = -\frac{1}{4}\csc(-8x)$

$y' = -\frac{1}{4}(-\csc(-8x)\cot(-8x)) \cdot -8$

$y' = -2\csc(-8x)\cot(-8x)$

$y' = -2(-\csc 8x)(-\cot 8x)$

$y' = -2\csc(8x)\cot(8x)$

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7.3

① d) $y = -\frac{1}{4}\csc(-8x)$

$y' = -\frac{1}{4}(-\csc(-8x)\cot(-8x)) \cdot -8$

$y' = -2\csc(-8x)\cot(-8x)$ *Negative Angle Identity

$y' = -2\csc(8x)\cot(8x)$

m) $y = 2x(\sqrt{x} - \cot x)$

$y = 2x^{3/2} - 2x\cot x$

$y' = 3x^{1/2} - [2\cot x + 2x(-\csc^2 x \cdot 1)]$

$y' = 3\sqrt{x} - 2\cot x + 2x\csc^2 x$

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Ex: $y = \sin(x^2)$ $u = x^2$

$y' = \cos(x^2) \cdot 2x$

$y' = 2x\cos(x^2)$

① n) $y = \sin(\tan x)$ $u = \tan x$

$y' = \cos(\tan x) \cdot \sec^2 x$

$y' = \sec^2 x[\cos(\tan x)]$

k) $y = \frac{1}{\sqrt{(\sec 2x - 1)^3}} = \frac{1}{(\sec 2x - 1)^{3/2}} = (\sec 2x - 1)^{-3/2}$

$y' = -\frac{3}{2}(\sec 2x - 1)^{-5/2} \cdot \sec 2x \tan 2x (2)$

$y' = \frac{-3\sec(2x)\tan(2x)}{(\sec 2x - 1)^{5/2}}$

$y' = -\frac{3\sec(2x)\tan(2x)}{\sqrt{(\sec 2x - 1)^5}}$

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① o) $y = \tan^2(\cos x) = [\tan(\cos x)]^2$

$y' = 2[\tan(\cos x)] \cdot \sec^2(\cos x) \cdot (-\sin x)(1)$

$y' = -2\sin x[\tan(\cos x)][\sec^2(\cos x)]$

b) $y = \frac{x^2 \boxed{\tan x}}{\boxed{\sec x}} = x^2\left(\frac{\sin x}{\cos x}\right) \cdot \left(\frac{\cos x}{1}\right) = x^2 \sin x$

$y' = x^2(\cos x)(1) + 2x(\sin x)$

$y' = x^2\cos x + 2x\sin x$

$y' = x[x\cos x + 2\sin x]$

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Final Review

① b) $f(x) = \boxed{\frac{2x-2}{x+3}}$ $f(x+h) = \boxed{\frac{2x+2h-2}{x+h+3}}$

$$f'(x) = \lim_{h\to 0} \frac{\frac{2x+2h-2}{\cancel{x+h+3}}(x+3)\cancel{(x+h+3)} - \frac{2x-2}{\cancel{x+3}}\cancel{(x+3)}(x+h+3)}{h(x+3)(x+h+3)}$$

$$= \lim_{h\to 0} \frac{\cancel{2x^2} + \cancel{2xh} - \cancel{2x} + \cancel{6x} + 6h - \cancel{6} - (\cancel{2x^2} + \cancel{2xh} + \cancel{6x} - \cancel{2x} - 2h - \cancel{6})}{h(x+3)(x+h+3)}$$

$$= \lim_{h\to 0} \frac{8\cancel{h}}{\cancel{h}(x+3)(x+h+3)} = \boxed{\frac{8}{(x+3)^2}}$$

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h) $y = (x^2)(\csc x)$

$y' = (x^2)(-\csc x\cot x)(1) + 2x\csc x$

$y' = -x^2\csc x\cot x + 2x\csc x$

$y' = x\csc x(-x\cot x + 2)$

$y' = x\csc x(2 - x\cot x)$

i) $y = \cot^3(1-2x)^2 = [\cot(1-2x)^2]^3$ $u = (1-2x)^2$ $du = 2(1-2x)(-2)$

$y' = 3[\cot(1-2x)^2]^2[-\csc^2(1-2x)^2][2(1-2x)(-2)]$

$y' = 3\cot^2(1-2x)^2[\csc^2(1-2x)^2][-4(1-2x)]$

$y' = 12(1-2x)\cot^2(1-2x)^2\csc^2(1-2x)^2$

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⑥ Find the points on the curve $y=\frac{x}{x-1}$ where the tangent line is parallel to the line $x+4y=1$

① $x+4y=1$

$4y=-x+1$

$y=-\frac{1}{4}x+\frac{1}{4}$

$m=-\frac{1}{4}$

② $y=\frac{x}{x-1}$

$x-1-x$

$y'=\frac{(x-1)(1)-(x)(1)}{(x-1)^2}$

$y'=\frac{-1}{(x-1)^2}$

③ $\frac{-1}{(x-1)^2}=-\frac{1}{4}$

$-(x-1)^2=-4$

$(x-1)^2=4$

$x^2-2x+1=4$

$x^2-2x-3=0$

$(x-3)(x+1)=0$

$x-3=0$ | $x+1=0$

$x=3$ | $x=-1$

④ $y=\frac{x}{x-1}$

$y=\frac{3}{3-1}$ | $y=\frac{-1}{-1-1}$

$y=\frac{3}{2}$ | $y=\frac{1}{2}$

$\boxed{(3, 3/2)}$ | $\boxed{(-1, 1/2)}$

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⑥ Find the point on the curve $y=x\sqrt{x}$ where the tangent line is parallel to the line $6x-y=4$

① $6x-y=4$

$6x-4=y$

$y=6x-4$

$m=6$

② $y=x\sqrt{x}=x(x)^{1/2}=x^{3/2}$

$y'=\frac{3}{2}x^{1/2}=\frac{3\sqrt{x}}{2}$

③ $\frac{3\sqrt{x}}{2}=\frac{6}{1}$

$3\sqrt{x}=12$

$\sqrt{x}=4$

$x=16$

④ $y=x\sqrt{x}$

$y=(16)\sqrt{16}$

$y=64$

$(16, 64)$

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