Section 4.5

1.) $f(x) = 2\sin x - \cos x \xrightarrow{D} f'(x) = 2\cdot\cos x - (-\sin x)$

5.) $f(x) = \tan x - \cot x \xrightarrow{D} f'(x) = \sec^2 x - (-\csc^2 x)$

6.) $f(x) = \sec x - \csc x \xrightarrow{D} f'(x) = \sec x \tan x - (-\csc x \cot x)$

9.) $f(x) = 2\sin(3x+1) \xrightarrow{D} f'(x) = 2\cdot\cos(3x+1)\cdot 3$

11.) $f(x) = \tan(4x) \xrightarrow{D} f'(x) = \sec^2(4x)\cdot 4$

13.) $f(x) = 2\sec(1+2x) \xrightarrow{D}$
$f'(x) = 2\cdot\sec(1+2x)\tan(1+2x)\cdot 2$

14.) $f(x) = -3\csc(3-5x) \xrightarrow{D}$
$f'(x) = -3\cdot -\csc(3-5x)\cot(3-5x)\cdot -5$

17.) $f(x) = \sin^3(x^2-3) \xrightarrow{D}$
$f'(x) = 3\sin^2(x^2-3)\cdot\cos(x^2-3)\cdot 2x$

18.) $f(x) = \cos^2(x^2-1) \xrightarrow{D}$
$f'(x) = 2\cos(x^2-1)\cdot -\sin(x^2-1)\cdot 2x$

19.) $f(x) = 3\sin^2(x^2) \xrightarrow{D}$
$f'(x) = 3\cdot 2\sin(x^2)\cdot\cos(x^2)\cdot 2x$

21.) $f(x) = 4\cos(x^2) - 2\cos^2 x \xrightarrow{D}$

24.) $f(x) = -3\cos^2(3x^2-4) \xrightarrow{D}$

$f'(x) = -3 \cdot 2\cos(3x^2-4) \cdot -\sin(3x^2-4) \cdot 6x$

27.) $f(x) = -2\tan^3(3x-1) \xrightarrow{D}$

$f'(x) = -2 \cdot 3\tan^2(3x-1) \cdot \sec^2(3x-1) \cdot 3$

28.) $f(x) = (\sin x)^{1/2} + \sin\sqrt{x} \xrightarrow{D}$

$f'(x) = \frac{1}{2}(\sin x)^{-1/2}\cos x + \cos\sqrt{x} \cdot \frac{1}{2}x^{-1/2}$

29.) $f(x) = (\sin(2x^2-1))^{1/2} \xrightarrow{D}$

$f'(x) = \frac{1}{2}(\sin(2x^2-1))^{-1/2} \cdot \cos(2x^2-1) \cdot 4x$

32.) $g(t) = \frac{\sin(3t)}{\cos(5t)} \xrightarrow{D}$

$$g'(t) = \frac{\cos(5t)\cdot\cos(3t)\cdot 3 - \sin(3t)\cdot -\sin(5t)\cdot 5}{\cos^2(5t)}$$

37.) $f(x) = \sin(2x-1)\cdot\cos(3x+1) \xrightarrow{D}$

$f'(x) = \sin(2x-1)\cdot -\sin(3x+1)\cdot 3$

$\quad + \cos(2x-1)\cdot 2 \cdot \cos(3x+1)$

41.) $f(x) = \sin x \cdot \sec x \xrightarrow{D}$

$f'(x) = \sin x \cdot \sec x \tan x + \cos x \cdot \sec x$

44.) $g(x) = \frac{1}{\sin(3x)} = \csc(3x) \xrightarrow{D}$

$g'(x) = -\csc(3x)\cot(3x)$

46.) $g(x) = \dfrac{1}{\csc^2(5x)} = \sin^2(5x) \xrightarrow{D}$

$g'(x) = 2\sin(5x)\cdot\cos(5x)\cdot 5$

48.) $h(x) = \cot(3x)\csc(3x) \xrightarrow{D}$

$h'(x) = \cot(3x)\cdot -\csc(3x)\cot(3x)\cdot 3$
$+ -\csc^2(3x)\cdot 3\cdot \csc(3x)$

51.) $h(s) = \sin^3 s + \cos^3 s \xrightarrow{D}$

$h'(s) = 3\sin^2 s\cdot\cos s + 3\cos^2 s\cdot -\sin s$

54.) $f(x) = \dfrac{1+\cos(3x)}{2x^3 - x} \xrightarrow{D}$

$f'(x) = \dfrac{(2x^3-x)\cdot -\sin(3x)\cdot(3) - (1+\cos(3x))\cdot(6x^2-1)}{(2x^3-x)^2}$

55.) $f(x) = \tan\left(\dfrac{1}{x}\right) \xrightarrow{D}$

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

56.) $f(x) = \sec(1+x^2)^{-1} \xrightarrow{D}$

$f'(x) = \sec(1+x^2)^{-1}\cdot\tan(1+x^2)^{-1}\cdot -(1+x^2)^{-2}\cdot 2x$

57.) $f(x) = \dfrac{\sec(x^2)}{\sec^2 x} \xrightarrow{D}$

$f'(x) = \dfrac{\sec^2 x\cdot\sec(x^2)\tan(x^2)\cdot 2x - \sec(x^2)\cdot 2\sec x\cdot\sec x\tan x}{\sec^4 x}$

59.) $y = \sin\left(\frac{\pi}{3}x\right) \xrightarrow{D} y' = \cos\left(\frac{\pi}{3}x\right)\cdot\frac{\pi}{3} = 0$

(horizontal tangent: $y' = 0$) $\longrightarrow$ $\cos\left(\frac{\pi}{3}x\right) = 0$

$\longrightarrow \frac{\pi}{3}x = \frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{2}, \ldots \longrightarrow$

$x = \frac{\pi}{2}\div\frac{\pi}{3}, \frac{3\pi}{2}\div\frac{\pi}{3}, \frac{5\pi}{2}\div\frac{\pi}{3}, \ldots \longrightarrow$

$x = \frac{3}{2}, \frac{9}{2}, \frac{15}{2} > 2\pi \longrightarrow$

$x = \frac{3}{2}, \frac{9}{2}$

60.) $y = \cos^2 x \xrightarrow{D} y' = 2\cos x\cdot -\sin x = 0$

(horizontal tangent: $y' = 0$) $\longrightarrow$

$\cos x = 0$ OR $\sin x = 0$

$x = \frac{\pi}{2}, \frac{3\pi}{2}$ $\qquad$ $x = 0, \pi, 2\pi$

63.) $D\sec x = D\left(\frac{1}{\cos x}\right) = D(\cos x)^{-1} \xrightarrow{1}$

$= -(\cos x)^{-2}\cdot -\sin x = \frac{\sin x}{\cos^2 x}$

$= \frac{1}{\cos x}\cdot\frac{\sin x}{\cos x} = \sec x\cdot\tan x$

65.) $f(x) = \sin\sqrt{x^2+1} \xrightarrow{D}$

$f'(x) = \cos\sqrt{x^2+1}\cdot\frac{1}{2}(x^2+1)^{-1/2}\cdot 2x$

69.) $f(x) = \sin^2(x^2-1) \xrightarrow{D}$

$f'(x) = 2\sin(x^2-1)\cdot\cos(x^2-1)\cdot 2x$

70.) $f(x) = \cos^2(2x^2+3) \xrightarrow{D}$

$f'(x) = 2\cos(2x^2+3) \cdot -\sin(2x^2+3) \cdot 4x$

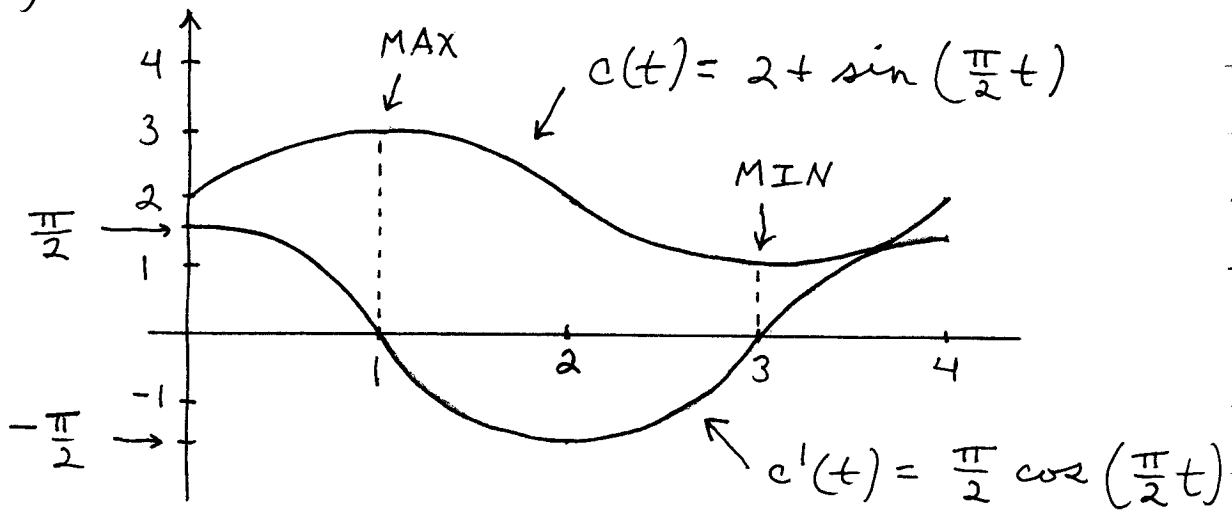
71.) $f(x) = \tan^3(3x^3-3) \xrightarrow{D}$

$f'(x) = 3\tan^2(3x^3-3) \cdot \sec^2(3x^3-3) \cdot 9x^2$

73.) $c(t) = 2 + \sin\left(\frac{\pi}{2}t\right)$

a.) $c'(t) = \cos\left(\frac{\pi}{2}t\right) \cdot \frac{\pi}{2}$

b.)



c.) i.) max $c(t)$: $c'(t) = 0$

ii.) $c'(t)$ (+) : $c(t)$ is ↑

iii.) $c'(t) = 0 \rightarrow$ $c(t)$ MAX or MIN