# HW 2.5 (selected answers)

Check the back of the book for other Solutions

P. 150 #1-29 odd, 35 - 49 odd, 59

**#3.** $y = [2\sin(x)]\cos(x)$ product rule!

$\frac{dy}{dx} = 2\sin(x)(-\sin(x)) + 2\cos(x)\cos(x)$

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

**#7.** $y = \sqrt{x} + 1 + \frac{1}{\sqrt{x}} = x^{1/2} + 1 + x^{-1/2}$ power rule!

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

**#9.** $r = [5\theta^2]\sec(\theta)$ product rule, w/ $\theta$ as independent variable

$\frac{dr}{d\theta} = (5\theta^2)\sec(\theta)\tan(\theta) + (10\theta)\sec(\theta)$

**#11.** $y = x^2\sin(x) + x\cos(x)$ product rule, twice!

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

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

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

**#19** $s = \frac{1+\sin(t)}{1+\tan(t)}$ quotient rule

$\frac{ds}{dt} = \frac{(1+\tan(t))(\cos(t)) - (1+\sin(t))(\sec^2(x))}{(1+\tan(t))^2}$

**#21** $s = \frac{t^{-1}+t^{-2}}{t^{-3}} = \frac{t^{-1}}{t^{-3}} + \frac{t^{-2}}{t^{-3}} = t^2 + t$ power rule

$\frac{ds}{dt} = 2t + 1$

**#27** $y = \frac{t^2}{\pi^3} - \frac{\pi^2}{t^3} = \frac{1}{\pi^3}\cdot t^2 - \pi^2\cdot t^{-3}$ power rule, $\pi$ is a constant.

$y' = \frac{2}{\pi^3}t + 3\pi^2 t^{-4} = \frac{2t}{\pi^3} + \frac{3\pi^2}{t^4}$

**#29** $y = \sec(x)\tan(x)\cos(x) = \tan(x)$

$\frac{dy}{dx} = \sec^2(x)$

#35. Slope of the curve at $x=\pi$; derivative at $x=\pi$

Should be w/o calculator

$y=\sec(x)$

$\frac{dy}{dx}=\sec(x)\tan(x)$ at $x=\pi$ $\sec(\pi)\tan(\pi)=\frac{1}{\cos(\pi)}\cdot\frac{\sin(\pi)}{\cos(\pi)}=-1(0)=\boxed{0}$

#39 $y=\frac{1}{\cos(x)}=\sec(x)$

$\frac{dy}{dx}=\sec(x)\tan(x)$ product rule!

$\frac{d^2y}{dx^2}=\sec(x)\sec^2(x)+\sec(x)\tan(x)\tan(x)=\boxed{\sec^3(x)+\sec(x)\tan^2(x)}$

Equivalent to book answer

#43 $y=\frac{x^4}{2}-\frac{3}{2}x^2-x \rightarrow y'=2x^3-3x-1 \rightarrow y''=6x^2-3 \rightarrow y'''=12x$

$\rightarrow y''''=12 \rightarrow y^{(5)}=0$ and 0 aftwards.

#47 $y=\sin(x)+\cos(x)$ $x=\frac{\pi}{4}$

point: $x=\frac{\pi}{4}$ $y=\sin(\pi/4)+\cos(\pi/4)=\frac{\sqrt{2}}{2}+\frac{\sqrt{2}}{2}=\sqrt{2}$

$(\pi/4, \sqrt{2})$

Slope: $\frac{dy}{dx}=\cos(x)-\sin(x)$ at $x=\pi/4$ $\cos(\pi/4)-\sin(\pi/4)=\frac{\sqrt{2}}{2}-\frac{\sqrt{2}}{2}=0$

T: $y-\sqrt{2}=0(x-\pi/4)$ OR $y=\sqrt{2}$

N: Vertical line at $x=\pi/4$

#49. $y=2x^3$ looking for $\frac{dy}{dx}=6$

$\frac{dy}{dx}=6x^2$ $6x^2=6$

$x^2=1$

$x=\pm 1$

$x=1$ $y=2(1)^3$, $y=2$, $\boxed{(1,2)}$

$x=-1$ $y=2(-1)^3$, $y=-2$, $\boxed{(-1,-2)}$

#59