$\boxed{GW\ 3.4}$

Find $\frac{dy}{dx}$

1. $y = \sin(\tan x)$

2. $y = (2x-3)^3 (x^2+2)^6$

3. $y = \frac{r}{\sqrt{r^2+1}}$ find $\frac{dy}{dr}$

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4. Find y' and y''

$y = \cos^2 x$

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5. Find equation of line tangent to $y = \sqrt{1+x^3}$ at $(2,3)$

3.4 Answer

① $y = \sin(\tan x)$

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

② $y = (2x-3)^3(x^2+2)^6$

$$\frac{dy}{dx} = 3(2x-3)^2(2)(x^2+2)^6 + 6(x^2+2)^5(2x)(2x-3)^3$$

③ $r = \frac{r}{\sqrt{r^2+1}}$

$$\frac{dy}{dr} = \frac{(1)\sqrt{r^2+1} - \frac{1}{2}(r^2+1)^{-1/2}(2r)(r)}{\left(\sqrt{r^2+1}\right)^2}$$

$$\frac{dy}{dr} = \frac{\sqrt{r^2+1} - r^2(r^2+1)^{-1/2}}{r^2+1} = \frac{1}{\sqrt{(r^2+1)^3}}$$

④ $y = \cos^3 x$

$$y' = 3\cos^2 x \sin x$$

$$y'' = 6\cos x \sin x \sin x - \cos x(3\cos^2 x)$$

$$= 6\cos x \sin^2 x - 3\cos^3 x$$

⑤ Find equation of tangent line to $y = \sqrt{1+x^3}$ at $(2,3)$

$$y = (1+x^3)^{1/2}$$

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

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

$$= \left(\frac{1}{6}\right)(12) = 2$$

$$y - 3 = 2(x-2)$$

$$\boxed{y = 2x - 1}$$