FIND THE DERIVATIVE OF EACH.

EG, BL

① $y=(1+2x)^4$

EV

② $y=\sqrt{9-x^2}$

JK

③ $y=(x^4+3)^2$

DM

④ $y=\sin 2x$

CM

⑤ $y=\tan(\sqrt{x})$

GP, JS

⑥ $y=e^{x^2}$

TD

⑦ $y=\left(1+\frac{1}{x}\right)^3$

KM

⑧ $y=\cos(2x^3-4)$

① $y=(1+2x)^4$ $\quad y'=8(1+2x)^3$

② $y=\sqrt{9-x^2}$ $\quad y'=\dfrac{-x}{\sqrt{9-x^2}}$

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

$y'=8x^3(x^4+3)$

④ $y=\sin(2x)$ $\quad y'=2\cos(2x)$

⑤ $y=\tan\sqrt{x}$ $\quad y'=\dfrac{\sec^2\sqrt{x}}{2\sqrt{x}}$

⑥ $y=e^{x^2}$ $\quad y'=2xe^{x^2}$

⑦ $y=\left(1+\frac{1}{x}\right)^3$ $\quad y'=-\frac{3}{x^2}\left(1+\frac{1}{x}\right)^2$

⑧ $y=\cos(2x^3-4)$ $\quad y'=-6x^2\sin(2x^3-4)$

Ex. $\int (2x-3)^2 dx$

before:

$$\int (4x^2-12x+9)dx = \frac{4x^3}{3} - 6x^2 + 9x + C$$

now:

$$\int (2x-3)^2 \boxed{dx}$$

inner most function

$u = 2x-3$

$\frac{du}{dx} = 2$

$du = 2\,dx \longrightarrow \frac{du}{2} = dx$

$$\int u^2 \cdot \frac{1}{2}\,du$$

$$\frac{1}{2}\int u^2\,du$$

$$= \frac{1}{2} \cdot \frac{u^3}{3} + C$$

$$= \frac{1}{6}(2x-3)^3 + C$$

Same? use WA to check

$$\frac{4x^3}{3} - 6x^2 + 9x - \frac{9}{2}$$

How do I use u-substitution to evaluate indefinite integrals?

Ex. $\int \cos(2x)\,dx$

Let $u = 2x$

$\frac{du}{dx} = \frac{2}{1} \rightarrow \frac{du}{2} = dx$

$\int (\cos u) \cdot \frac{1}{2} \cdot du$

$\frac{1}{2}\int \cos u\,du$

$= \frac{1}{2}\sin u + C$

$= \frac{1}{2}\sin(2x) + C$

Ex. $\int x^2(1-x^3)^5\,dx$

$\int u^5 \cdot \frac{1}{-3}\,du$

$= -\frac{1}{3}\int u^5\,du$

$= -\frac{1}{3}\cdot\frac{u^6}{6} + C$

$= -\frac{1}{18}(1-x^3)^6 + C$

$u = 1-x^3$

$\frac{du}{dx} = -3x^2$

$du = -3x^2\,dx$

$\frac{du}{-3} = x^2\,dx$

Let's look $\int x(1-x^3)^5\,dx$

$u = 1-x^3$

$du = -3x^2\,dx$

* Can't use u-sub w/ variable ↓ would have to use algebra 1st!

Turn in work from 2/14

P. 297: 7-33 odd Book