

Ch. 12 - BOARD PROBLEMS

FIND $\frac{dy}{dx}$.

$$\textcircled{1} \quad y = (5x^2 + 3)^4$$

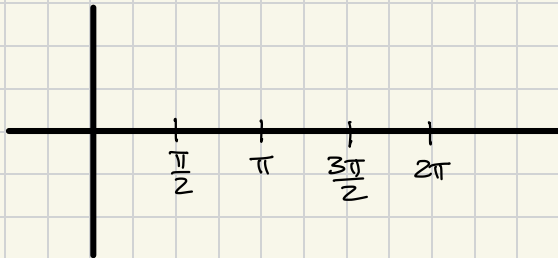
$$\textcircled{2} \quad y = \sqrt{-2x^2 + 1}$$

$$\textcircled{3} \quad y = (3x^3 + 1)(-4x^2 - 3)^4$$

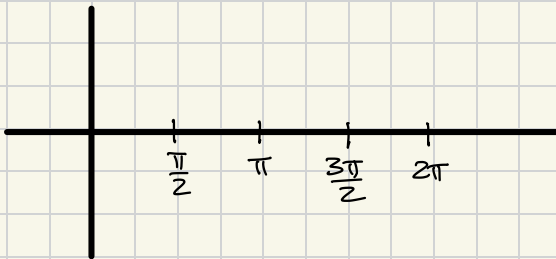
$$\textcircled{4} \quad y = \frac{(x^3 + 4)^5}{3x^4 - 2}$$

Ch. 12 - DERIVATIVES OF TRIG FUNCTIONS

$$f(x) = \sin x$$



$$y' = \underline{\hspace{2cm}}$$



DERIVATIVE RULES FOR TRIGONOMETRIC FUNCTIONS

- ① $\sin' u = \cos u \cdot du$
- ② $\cos' u = -\sin u \cdot du$
- ③ $\tan' u = \sec^2 u \cdot du$
- ④ $\cot' u = -\csc^2 u \cdot du$
- ⑤ $\sec' u = \sec u \cdot \tan u \cdot du$
- ⑥ $\csc' u = -\csc u \cdot \cot u \cdot du$

EX. 1

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

EX. 2

$$y = 2 \cos(7x^2)$$

EX. 3

$$y = \tan \sqrt{1-2x}$$

EX. 4

$$y = x^2 \cdot \sec(2x)$$

EX. 5

$$y = 3 \cot\left(\frac{x}{3}\right)$$

PROOF FOR DERIVATIVE OF COS.

$$\cos(u) = \sin(90^\circ - u) \quad \sin u = \cos(90^\circ - u)$$

$$\frac{du}{dx} (\sin 90^\circ - u) = \cos(90^\circ - u) \cdot -1$$

$$= -\cos(90^\circ - u)$$

USING THE DIFFERENCE FORMULA

$$-[\cos 90^\circ \cdot \cos u + \sin 90^\circ \cdot \sin u] = -[0 \cdot \cos u + 1 \cdot \sin u]$$

$$= -\sin u$$

EX. 9 RECOGNIZING TYPES OF PROBLEMS

I. SUM AND DIFFERENCE FORMULA PROBLEMS

$$(a) \quad y = \sin(2x) - (\tan(x))^2$$

$$(b) \quad y = 4 \sec(3x) + \tan(x) - (\sec(x))^5$$

II. PRODUCT RULES

$$(a) \quad y = (\sin 2x)(\cos(4x^2))$$

$$(b) \quad y = \cos(x-1)(\tan^2(x))$$

III. POWER RULES PROBLEMS

$$(a) \quad y = \tan^4(\sin(x^2))$$

$$(b) \quad y = 4[\sin x + \cos 2x]^3$$

IV. QUOTIENT RULES

$$y = \frac{\sin(2x)}{\cos(3x)}$$

V. TRIGONOMETRY PROBLEMS

$$(a) \quad y = \tan(\sin(3x))$$

$$(b) \quad y = \cos(\sec^2(4x-1))$$

FIND THE DERIVATIVES OF EACH.

$$(a) \ y = \sin(2x) - (\tan(x))^2$$

$$(b) \ y = 4 \sec(3x) + \tan(x) - (\sec(x))^5$$

$$(a) \ y = (\sin 2x)(\cos(4x^2))$$

$$(b) \ y = \cos(x-1)(\tan^2(x))$$

$$(a) \ y = \tan^4(\sin(x^2))$$

$$(b) \ y = 4 [\sin x + \cos 2x]^3$$

$$y = \frac{\sin(2x)}{\cos(3x)}$$

$$(a) \ y = \tan(\sin(3x))$$

$$(b) \ y = \cos(\sec^2(4x-1))$$

LESSON PRACTICE

Find $f'(x)$.

1. $f(x) = \cos(3x)$

2. $f(x) = \sin\left(\frac{x}{2}\right)$

3. $f(x) = \tan(2x)$

4. $f(x) = \sec(4x)$

5. $f(x) = 2 \cot\left(\frac{x}{2}\right)$

6. $f(x) = x \sin(2x)$

7. $f(x) = x^2 \tan(2x)$

LESSON PRACTICE 12A

8. $f(x) = \sin(x) \tan(x)$

9. $f(x) = \frac{1}{2} \sin^2(x)$

10. $f(x) = \sqrt{\cos(2x)}$

11. $f(x) = \sin(2x) + \cos(3x)$

12. $f(x) = [\sin(x^2 + 1)]^3$

Leave final answer in factored form for problems 13 and 14.

13. $f(x) = \frac{\cot(4x)}{\csc(2x)}$

14. $f(x) = (\tan^2(3x)) (\sec(3x))$