

AP Calculus AB
 Lessons 3-3, 3-5 & 4-4 Learning Check

Name Heml 2016
 Date _____

NO CALCULATOR

For problems 1 and 2, find $\frac{dy}{dx}$.

1. $y = \frac{x^2}{\cos x}$

- (A) $\frac{2x}{\sin x}$ (B) $-\frac{2x}{\sin x}$ (C) $\frac{2x \cos x - x^2 \sin x}{\cos^2 x}$
 (D) $\frac{2x \cos x + x^2 \sin x}{\cos^2 x}$ (E) $\frac{2x \cos x + x^2 \sin x}{\sin^2 x}$

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

$$= \frac{2x \cos x + x^2 \sin x}{\cos^2 x}$$

2. $y = \sec^2 x$

- (A) $2 \sec x$ (B) $2 \sec x \tan x$ (C) $2 \sec^2 x \tan x$
 (D) $\sec^2 x \tan^2 x$ (E) $\tan x$

$$y = \sec x | \sec x$$

$$\frac{dy}{dx} = \sec x \cdot \sec x \tan x + \sec x \cdot \sec x \tan x$$

$$= \sec^2 x \tan x + \sec^2 x \tan x$$

$$= 2 \sec^2 x \tan x$$

OVER →

3. Given the following information about differentiable functions $f(x)$ and $g(x)$ at $x = 2$ and $x = 3$,

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
2	8	2	$1/3$	-3
3	3	-4	2π	5

determine the value of:

$\frac{2}{3}$ a) $\frac{d}{dx}\{2f(x)\}$ at $x = 2 = 2 \cdot f'(2) = 2 \cdot \frac{1}{3} = \frac{2}{3}$

$2\pi + 5$ b) $\frac{d}{dx}\{f(x) + g(x)\}$ at $x = 3 = f'(3) + g'(3) = 2\pi + 5$

$15 - 8\pi$ c) $\frac{d}{dx}\{f(x) \cdot g(x)\}$ at $x = 3 = f(3)g'(3) + g(3)f'(3) = 3 \cdot 5 + (-4)(2\pi) = 15 - 8\pi$

$\frac{37}{6}$ d) $\frac{d}{dx}\left\{\frac{f(x)}{g(x)}\right\}$ at $x = 2$

$$= \frac{g(2) \cdot f'(2) - f(2) \cdot g'(2)}{(g(2))^2}$$

$$= \frac{2 \left(\frac{1}{3}\right) - 8(-3)}{2^2} = \frac{\frac{2}{3} + 24}{4} = \frac{2}{3} \cdot \frac{1}{4} + 24 \cdot \frac{1}{4}$$

$$= \frac{1}{6} + 6$$

4. $\lim_{x \rightarrow e} \frac{(x^{20} - 3x) - (e^{20} - 3e)}{x - e}$ is

- (A) 0 (B) $20e^{19} - 3$ (C) $e^{20} - 3e$ (D) nonexistent

$f(x) = x^{20} - 3x$ $a = e = x$

$f'(x) = 20x^{19} - 3$

$f'(e) = 20e^{19} - 3$