Unit 3 - Differentiation: Composite, Implicit, and Inverse Functions

***Implicit Differentiation**- function in terms of x's and y's $\left(\text{must write } \frac{dy}{dx} \text{ everytime you take a deriv. of } y\right)$

EX#1: $x^2y + y^3 + x^2 = 5$

derivative $\Rightarrow$

*** Differentiating Inverse Functions**

EX#1: The functions *f(x)* and *g(x)* are inverses of each other.

f(1) = 3 *g(3)* =

f'(1) = 7 *g'(3)* =

***Inverse Trig. Functions** $y = \arcsin f(x)$ $y = \arctan f(x)$ $y = \operatorname{arc\,sec} f(x)$

$y' =$ $y' =$ $y' =$

EX#1: $y = \arcsin x^4$ **EX#2:** $y = \arctan 2x^3$ **EX#3:** $y = \operatorname{arc\,sec} e^x$

$y' =$ $y' =$ $y' =$

$y' =$ $y' =$ $y' =$

Sample AP Problems:

2013 AP Practice Exam Multiple Choice

4. Which of the following is an equation of the line tangent to the graph of $x^2 - 3xy = 10$ at the point $(1, -3)$?

(A) $y + 3 = -11(x - 1)$

(B) $y + 3 = -\frac{7}{3}(x - 1)$

(C) $y + 3 = \frac{1}{3}(x - 1)$

(D) $y + 3 = \frac{7}{3}(x - 1)$

(E) $y + 3 = \frac{11}{3}(x - 1)$

17. If $\lim_{h \to 0} \frac{\arcsin(a + h) - \arcsin(a)}{h} = 2$, which of the following could be the value of a?

(A) $\frac{\sqrt{2}}{2}$ (B) $\frac{\sqrt{3}}{2}$ (C) $\sqrt{3}$ (D) $\frac{1}{2}$ (E) 2

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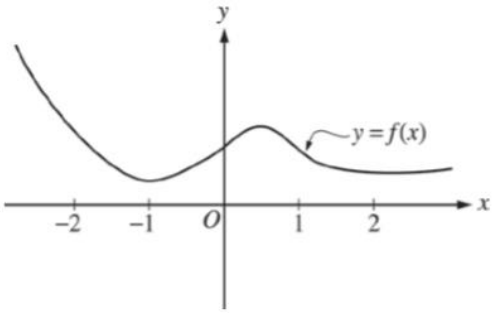
18. If $\ln(2x + y) = x + 1$, then $\frac{dy}{dx} =$

(A) -2 (B) $2x + y - 2$ (C) $2x + y$ (D) $4x + 2y - 2$ (E) $y - \frac{y}{x}$

23. Let f be the function defined by $f(x) = 2x + e^x$. If $g(x) = f^{-1}(x)$ for all x and the point $(0, 1)$ is on the graph of f, what is the value of $g'(1)$?

(A) $\frac{1}{2+e}$ (B) $\frac{1}{3}$ (C) $\frac{1}{2}$ (D) 3 (E) $2 + e$



88. The graph of a twice-differentiable function f is shown in the figure above. Which of the following is true?

(A) $f'(-1) < f'(1) < f'(0)$

(B) $f'(-1) < f'(0) < f'(1)$

(C) $f'(0) < f'(-1) < f'(1)$

(D) $f'(1) < f'(-1) < f'(0)$

(E) $f'(1) < f'(0) < f'(-1)$

2014 AP Practice Exam Multiple Choice

25. If $y = x^2 - 2x$ and $u = 2x + 1$, then $\frac{dy}{du} =$

(A) $\frac{2(x^2 + x - 1)}{(2x+1)^2}$ (B) $6x^2 - 3x - 2$ (C) $4x$ (D) $x - 1$ (E) $\frac{1}{x-1}$

x	$f(x)$	$g(x)$	$f'(x)$
–4	0	–9	5
–2	4	–7	4
0	6	–4	2
2	7	–3	1
4	10	–2	3

92. The table above gives values of the differentiable functions f and g, and f', the derivative of f, at selected values of x. If $g(x) = f^{-1}(x)$, what is the value of $g'(4)$?

(A) $-\frac{1}{3}$ (B $-\frac{1}{4}$ (C) $-\frac{3}{100}$ (D $\frac{1}{4}$ (E) $\frac{1}{3}$