AP Calculus BC '19 Name_____
Dr. Quattrin
Derivative Test

Multiple choice – Circle correct answer.

1. Let f be a differentiable function with $f(3)=2$ and $f'(3)=5$, and let g be a function defined by $g(x)=xf(x)$. Which of the following is an equation of the line normal to the graph of g at the point where $x=3$?

a) $y-2=5(x-3)$ b) $y-2=-\frac{1}{5}(x-3)$

c) $y-6=17(x-3)$ d) $y-6=\frac{1}{17}(x-3)$

e) $y-6=-\frac{1}{17}(x-3)$

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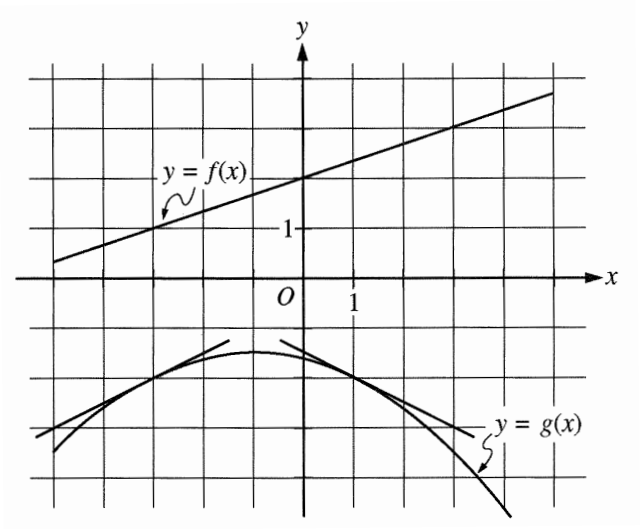
2. The figure below shows the graph of the functions f and g. The graphs of the lines tangent to the graph of g at $x=-3$ and $x=1$ are also shown. If $B(x)=f(g(x))$, what is $B'(1)$?



a) $-\frac{1}{2}$

b) $-\frac{1}{6}$

c) $\frac{1}{6}$

d) $\frac{1}{3}$

e) $\frac{1}{2}$

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3. Which of the following statements must be true?

I. $\frac{d}{dx}\left(x\sec^{-1}x\right)=\sec^{-1}x+\frac{1}{\sqrt{x^2-1}}$

II. $\frac{d}{dx}\left(\frac{3-2x}{3x+2}\right)=\frac{13}{(3x+2)^2}$

III. $\frac{d}{dx}\ln(1-x)=\frac{1}{x-1}$

a) I only b) II only c) II and III only

d) I and III only e) I, II, and III

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4. Let $y = f(x)$ be the solution to the differential equation $\frac{dy}{dx} = y + xy$ with the initial condition $f(0) = 1$. What is the best approximation for $f(3)$ if Euler's method is used, starting at $x = 0$ with a step size of 1?

a) 0 b) 1 c) 2 d) 6 e) 24

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5. If $f(x) = \sin[g(x)]$, then $\frac{d}{dx}[f(x)]$ is

a) $\sin x \cdot g'(x) + g(x) \cdot \cos x$ b) $\sin x \cdot g'(x) - g(x) \cdot \cos x$

c) $\cos x \cdot g'(x)$ d) $\cos[g(x)] \cdot g'(x)$

e) None of these

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6. The slope of the line tangent to the curve $xy^3 + x^2y^2 = 6$ at $(2,1)$ is

a) -1 b) $-\frac{3}{5}$ c) $-\frac{5}{14}$ d) $-\frac{3}{14}$ e) 0

FREE RESPONSE – show all work in a clear, organized manner. Simplify answers.

7. $\frac{d}{dx}\left[-3x^4 + 7 - \frac{6}{5}x^{5/3} - \frac{3}{\sqrt[5]{x^6}} - \frac{1}{12x}\right]$

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8. If $g(x) = \sec^{-1} 3x^2$, find $g''(x)$

9. If $f(x) = e^{\cot 3x}$, find $f''(x)$.

10. Given $x^3 + xy = 2y^2 + y + 7$.

a) Show that $\frac{dy}{dx} = \frac{3x^2 + y}{4y - x + 1}$

b) Find the slopes of the tangent lines at all the points where the curve intersects the line $x = 2$.

c) Set up, but do not solve, an equation to determine all the points on the curve that have a vertical tangent line.