AP Calculus AB '23-24 Name_____
Dr. Quattrin – 1st Period
Derivative Test score _____

Part I: Multiple choice (20 minutes) – Circle correct answer.

1. Suppose f is a differentiable function such that $f(-2) = 1$ and $f'(-2) = \frac{1}{4}$. Using the line tangent to the graph of $f(x)$ at $x = -2$, find the approximation of $f(-1.9)$

a) 0.975 b) -2.225 c) 1.775 d) 1.025

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2. If $f(x) = \sin x$, then $f'\left(\frac{\pi}{3}\right) =$

(a) $-\frac{1}{2}$ (b) $\frac{1}{2}$ (c) $\frac{\sqrt{3}}{2}$ (d) $\frac{\sqrt{2}}{2}$ (e) $\sqrt{3}$

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3. Which of the following statements must be false?

a) $\frac{d}{dx}(x\tan x) = \tan x + x\sec^2 x$

b) $\frac{d}{dx}\left(\frac{3}{4+x^2}\right) = \frac{-6x}{(4+x^2)^2}$

c) $\frac{d}{dx}\sqrt{1-x} = \frac{1}{2\sqrt{1-x}}$

d) $\frac{d}{dx}(\ln x^3) = \frac{3}{x}$

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4. A particle moves along a straight line with equation of motion $s = t^3 + t^2$. Find the value of t at which the acceleration is zero.

a) $-\frac{2}{3}$ b) $-\frac{1}{3}$ c) $\frac{2}{3}$ d) $\frac{1}{3}$ e) $-\frac{1}{2}$

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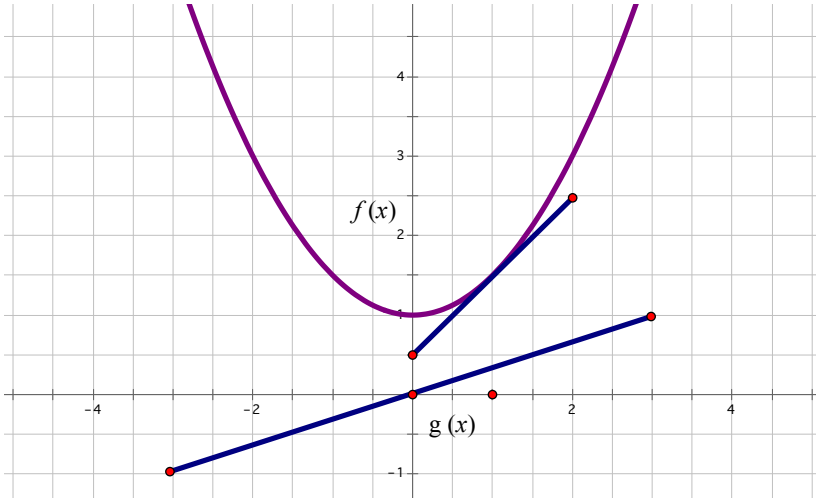
5. The figure below shows the graph of the functions f and g. The graph of the line tangent to the graph of f at $x = 1$ are also shown. If $B(x) = f(x) \cdot g(x)$, what is $B'(1)$?



a) $\frac{5}{6}$ b) $-\frac{1}{2}$ c) $-\frac{1}{6}$ d) $\frac{1}{3}$ e) $\frac{7}{6}$

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6. Let the function f be differentiable on the interval $[0,2.5]$ and define g by $g(x) = f(f(x))$. Use the table to find $g'(2.0)$.

x	0.0	0.5	1.0	1.5	2.0	2.5
$f(x)$	0.5	1.5	2.0	2.5	1.0	0.0
$f'(x)$	0.1	0.3	0.6	1.1	2.0	2.2

a) 0.0 b) 1.2 c) 1.65 d) 2.08 e) 2.42

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7. If $y = \sin e^x$, then $\dfrac{d^2y}{dx^2} =$

a) $\cos e^x$ b) $e^x \sin e^x + e^{2x} \cos e^x$

c) $-e^{2x} \sin e^x + e^x \cos e^x$ d) $e^{2x} \sin e^x - e^x \cos e^{2x}$

e) $e^x \cos e^x$

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8. If $f(x) = \cos^2(3 - x)$, then $f'(0) =$

a) $-2\cos 3$ b) $-2\sin 3\cos 3$ c) $6\cos 3$

d) $2\sin 3\cos 3$ e) $6\sin 3\cos 3$

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9. Let $f(x)$ be the function given by $f(x) = \sqrt[3]{x^2 + 2}$. What is the slope of the line tangent to $f(x)$ at $(5,\ 3)$?

a) $-\dfrac{10}{27}$ b) $\dfrac{10}{27}$ c) $\dfrac{2}{\sqrt[3]{11^2}}$ d) $\dfrac{-2}{\sqrt[3]{11^2}}$

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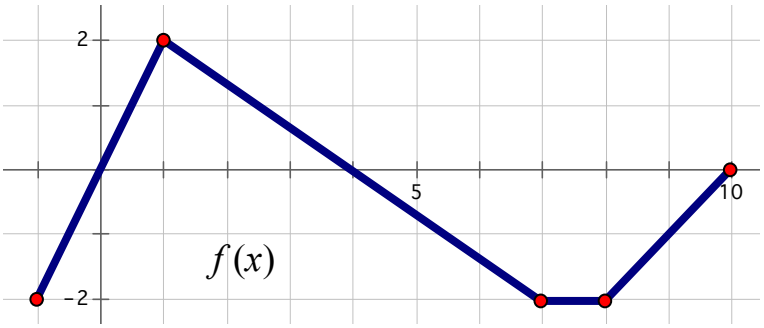
Part II: Free Response (35 minutes) – Show all work.

1a. $\frac{d}{dx}\left(cot^{-1}\left(e^{5x}\right)\right)$

1b. $\frac{d}{dx}\left(6e^{\sqrt{1-x^2}}\right)$



x	$g(x)$	$g'(x)$
0	-2	12
2	0	-3
4	5	5
6	3	8
8	-4	11

2. Let $f(x)$ be the function whose graph is given above and let $g(x)$ be a differentiable function with selected values for $g(x)$ and $g'(x)$ given on the table above.

a) Find the equation of the line tangent to $g(x)$ at $x = 4$.

b) Let K be the function defined by $K(x) = g(f(x))$. Find $K'(1)$.

c) Let M be the function defined by $M(x) = g(x) \cdot f(x)$. Find $M'(4)$.

d) Let J be the function defined by $J(x) = \dfrac{f(2x)}{g(x)}$. Find $J'(2)$.

3. If $g(x) = \sqrt[3]{4 - x^3}$, find $g''(x)$

4. Find the equations of the lines tangent and normal $y = x\ln\left(5 - x^2\right)$ at $x = 2$.

EC. Using the results in #4 above, approximate $g(2.8)$.