Unit 2 Progress Check: MCQ Part B

1. Let g be the function given by $g(x) = x^4 - 3x^3 - x$. What are all values of x such that $g'(x) = \frac{1}{2}$?

(A) -2.750

(B) 2.297

(C) 2.320 ✓

(D) -0.353 and 3.119

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2. Let f be the function given by $f(x) = x^3 + 3x^2 - 4$. What is the value of $f'(2)$?

(A) 48

(B) 24 ✓

(C) 20

(D) 10

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3. If $f(x) = 4x^6 - 3x^4 + 2x^3 + e^2$, then $f'(x) =$

(A) $4x^5 - 3x^3 + 2x^2$

(B) $24x^5 - 12x^3 + 6x^2$ ✓

(C) $24x^5 - 12x^3 + 6x^2 + 2e$

(D) $24x^6 - 12x^4 + 6x^3$

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4. If $g(x) = 4\cos x + 2\sin x + 1$, then $g'\left(\frac{\pi}{6}\right) =$

(A) $-2 + \sqrt{3}$ ✓

(B) $2 - \sqrt{3}$

(C) $2 + \sqrt{3}$

(D) $2 + 2\sqrt{3}$

5. Let g be the function given by $g(x) = \lim_{h \to 0} \frac{\sin(x+h) - \sin x}{h}$. What is the instantaneous rate of change of g with respect to x at $x = \frac{\pi}{3}$?

(A) $-\frac{\sqrt{3}}{2}$ ✓

(B) $-\frac{1}{2}$

(C) $\frac{1}{2}$

(D) $\frac{\sqrt{3}}{2}$

6. $\lim_{h \to 0} \frac{5e^{x} - 5e^{x+h}}{3h} =$

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(A) $-5e^x$

(B) $5e^x$

(C) $-\frac{5}{3}e^x$ ✓

(D) $\frac{5}{3}e^x$

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7. The function f is given by $f(x) = \left(x^3 + bx + 6\right)g(x)$, where b is a constant and g is a differentiable function satisfying $g(2) = 3$ and $g'(2) = -1$. For what value of b is $f'(2) = 0$?

(A) -7

(B) -10

(C) -12

(D) -22 ✓

8.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
4	2	7	3	5

The table above gives the values of the differentiable functions f and g and their derivatives at $x = 4$. What is the value of $\frac{d}{dx}\left(f(x)g(x)\right)$ at $x = 4$?

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(A) 11

(B) 29

(C) 31 ✓

(D) 35

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9. If $f(x) = \sqrt{x}\cos x$, then $f'(x) =$

(A) $-\frac{\sin x}{2\sqrt{x}}$

(B) $\frac{1-2\sqrt{x}\sin x}{2\sqrt{x}}$

(C) $\frac{\cos x-2x\sin x}{2\sqrt{x}}$ ✓

(D) $\frac{\cos x+2x\sin x}{2\sqrt{x}}$

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10. If $f(x) = \frac{2x^2-1}{5x+3}$, then $f'(-1) =$

(A) $-\frac{3}{2}$

(B) $-\frac{4}{5}$

(C) $\frac{3}{4}$ ✓

(D) $\frac{13}{4}$

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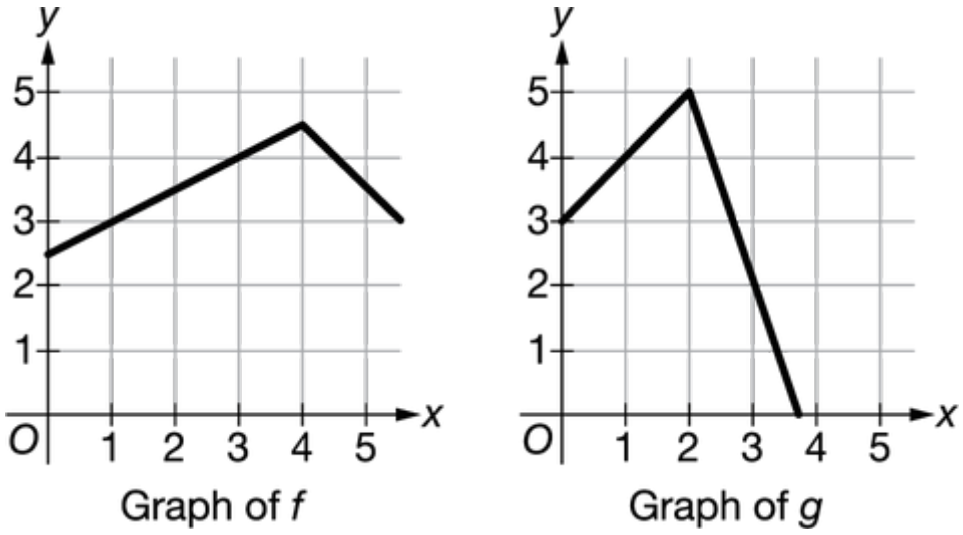
11.



The graphs of the functions f and g are shown above. If $h(x) = \frac{f(x)+4}{g(x)+2x}$, then $h'(3) =$

(A) $-\frac{1}{2}$

(B) $-\frac{1}{16}$

(C) $\frac{3}{16}$ ✓

(D) $\frac{3}{2}$

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12. What is the slope of the line tangent to the graph of $y = \frac{9x^2}{x+2}$ at $x = 1$?

(A) 3

(B) 5 ✓

(C) 7

(D) 18

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13. $\frac{d}{dx}(\tan x) =$

(A) $-\cot x$

(B) $-\csc^2 x$

(C) $\cot x$

(D) $\sec^2 x$ ✓

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14. $\frac{d}{dx}(\csc x) =$

(A) $\sec x$

(B) $-\sec x$

(C) $\csc x \cot x$

(D) $-\csc x \cot x$ ✓

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15. Below is an attempt to derive the derivative of $\sec x$ using the product rule, where x is in the domain of $\sec x$. In which step, if any, does an error first appear?

- Step 1: $\sec x \cdot \cos x = 1$
- Step 2: $\frac{d}{dx}(\sec x \cdot \cos x) = 0$
- Step 3: $\frac{d}{dx}(\sec x) \cdot \cos x - \sec x \cdot \sin x = 0$
- Step 4: $\frac{d}{dx}(\sec x) = \frac{\sec x \cdot \sin x}{\cos x} = \sec x \cdot \frac{\sin x}{\cos x} = \sec x \cdot \tan x$

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(A) Step 1

(B) Step 2

(C) Step 3

(D) There is no error. ✔