Derivatives - AP Calculus

Solve each of the following:

1. If $y = \frac{2x^5}{x+1} - 2x$, then $\frac{dy}{dx} =$

A) $\frac{8x^5+10x^4}{(x+1)^2} - 2$

B) $\frac{6x^5+10x^4}{(x+1)^2} - 2$

C) $\frac{10x^5+8x^4}{(x+1)^2} - 2$

D) $\frac{8x^5+10x^4}{(x+1)^2} + 2$

2. $\lim_{h \to 0} \frac{(2(1+h)^2-(1+h))-(2(1)^2-1)}{h} =$

A) 1
B) 2
C) 3
D) 4

3. The position of a car is modeled by $y(t) = \frac{1}{4}t^2 - 2t + 4$ for time $t \geq 0$. What is the position of the particle when its velocity is equal to 4.

A) 12

B) 16

C) 20

D) 24

4. What is the slope of the line tangent to the graph of $y = 4x^3 - x^2 + 3$ when $x = 3$

A) 116

B) 105

C) 108

D) 102

$$f(x)=\begin{cases} 3x^2+x-2\ ,\ x<-2 \\ x^2+4\ ,\ -2\le x<0 \\ x^2\ ,\ x\ge 0 \end{cases}$$

5. The function f is defined above. At what values of x if $f(x)$ not differentiable?

A) -2 only

B) 0 only

C) -2 and 0

D) -1 only

$$f(x) = \begin{cases} 3x^2 - 2x + 2 \ , \ x \leq 2 \\ h(x) \ \ , \ x > 2 \end{cases}$$

6. The function f is defined above. If f is differentiable at x=2, which of the following functions could define $g(x)$?

A) $5x$

B) $10x - 10$

C) $2x^2 - 3$

D) $8x - 8$

$$f(x) = \begin{cases} a\sqrt{x} + bx^2 - 1 \ , & x < 4 \\ \dfrac{16}{x} + bx \ , & x \geq 4 \end{cases}$$

7. (CALCULATOR) The function f is defined above. For which values of a and b would make f differentiable at $x = 4$?

A) $a = 2, b = -1$

B) $a = \frac{44}{11}, b = \frac{12}{13}$

C) $a = \frac{47}{11}, b = \frac{-13}{44}$

D) $a = \frac{-44}{11}, b = \frac{-13}{44}$

8. (CALCULATOR) The function f is defined by $f(x) = x + \frac{1}{x}$. The slope of the line tangent to the graph at the point (2 , 2.5) is

A) 0.5

B) 0.25

C) -0.75

D) 0.75

E) -0.5

9. The function f is defined by $f(x) = x + \frac{1}{x}$. The slope of the line tangent to the graph of $y = f(x)$ at the point $(x,\ x + \frac{1}{x})$

(I) Approaches 0 as $x \to +\infty$;

(II) Approaches 1 as $x \to -\infty$;

(III)Approaches -∞ as $x \to 0^{+}$;

A) I only

B) I and II

C) II and III

D) I, II, and III

E) None of the above

10. Find $y'(x)$ if $y = (x^4 - 1)(\frac{3}{4}x^3 - x^2 + 1)$

A) $y' = \frac{21}{4}x^6 - 6x^5 + 4x^3 - \frac{9}{4}x^2 + 2x$

B) $y' = \frac{15}{4}x^6 - 6x^5 + 4x^3 - \frac{9}{4}x^2 + 2x$

C) $y' = \frac{21}{4}x^6 - 5x^5 + 4x^3 - \frac{9}{4}x^2 + 2x$

D) $y' = \frac{21}{4}x^6 - 6x^5 + 4x^3 - \frac{9}{4}x^2 + 3x$