Exam 12 **Name: _____** **RHS**
AP Calculus AB

Total 85 points
Part I: multiple choices (3 pts for the correct answer / 2 pts for explanation)

1. If $f(x) = e^{g(x)}$ and $g'(x) = h(x)$, what is $f'(x)$?

a) $e^{g(x)}$ b) $e^{h(x)}$ c) $e^{g(x)}h(x)$ d) $e^{g(x)}g(x)$ e) $e^{h(x)}g(x)$

2. Let f and g be differential functions such that

$$f(1) = 3, \quad f'(1) = 2, \quad f'(3) = -3$$
$$g(1) = 3, \quad g'(1) = -5, \quad g'(3) = 4$$

If $h(x) = f\big(g(x)\big)$, then $h'(1) =$

a) 2 b) -10 c) 15 d) -20 e) -12

3. What is $\lim_{h\to 0} \frac{3(2+h)^3 - 24}{h}$?

a) 9 b) 18 c) 27 d) 36 e) 45

Part II – Free response (8 pts each)

Find $f'(1)$.

4. $f(x) = \sqrt{x} - e^x$

5. $f(x) = \frac{x^3 - 3x^2 + \sqrt{x}}{x^2}$

6. $f(x) = \frac{e^x}{2x}$

7. $f(x) = \frac{x-1}{x+1}$

8. $f(x) = (1 - x^2)^3(2x + x^3)^4$

Part III – Free response (15 pts each)

9. Let $f(x) = \sqrt{2x+1} - 3e^{x^2}$
   a. Find an equation of the tangent line at $x = 0$
   b. Find an equation of the normal line at $x = 0$

10. For the given equation below,

$$\lim_{h \to 0} \frac{e^h - 1}{h} = f'(c)$$

a) What is $f(x)$?
b) What is the value of c?
c) Evaluate the given limit expression.