9. [9 points] For the following problems, choose the correct answer. If none of the choices are correct, circle **NONE OF THESE**.

**a. [2 points]** Which of the following is an antiderivative of the function \(1/x + \cos(x)\) for \(x > 0\)? Circle **all correct answers**.

i. \(-1/x^2 - \sin(x)\)  
ii. \(\ln(5x) + \sin(x)\)  
iii. \(\ln(x) + \sin(x) - 20\)  
v. \(1/x^2 + \sin(x)\)  
vi. **NONE OF THESE**

**b. [2 points]** Suppose \(f(x)\) is a differentiable, invertible function defined on \((-\infty, \infty)\) with \(f'(x) > 0\) for all \(x\). Suppose that \(f(3) = 5\) and \(f'(3) = 2\). Which of the following statements must be true? Circle **all correct answers**.

i. \(f'(f^{-1}(x)) = \frac{1}{(f^{-1})'(x)}\)  
ii. \((f^{-1})'(x) = \frac{1}{f'(x)}\)  
v. \(f'(2) = \frac{1}{5}\)  
vi. **NONE OF THESE**

**c. [2 points]** If \(p(t)\) is an even function that is differentiable on \((-\infty, \infty)\), which of the following must be true? Circle **all correct answers**.

i. \(\int_{1}^{4} p(t) \, dt = \int_{-1}^{-4} p(t) \, dt\)  
ii. \(\int_{-4}^{4} p(t) \, dt = 0\)  
v. \(\int_{-5}^{5} p'(t) \, dt = 0\)  
vi. **NONE OF THESE**

**d. [3 points]** Suppose the limit definition of the derivative gives

\[ g'(1) = \lim_{h \to 0} \frac{2^c(-1+h) + a(-1 + h)^3 - (2^{-c} - a)}{h}, \]

where \(a\) and \(c\) are nonzero constants. Which of the following could be the formula for \(g(x)\)? Circle the **one** best answer.

i. \(g(x) = 2^{-cx} + ax\)  
ii. \(g(x) = a(x - 1)^3 + c^x\)  
iii. \(g(x) = 2^c - a\)  
v. \(g(x) = 2^{cx} + ax^3\)  
iv. \(g(x) = 2^{c(x+h)} + ah^3\)  
vi. **NONE OF THESE**