10. [9 points] For each of the following, circle all correct answers. No justification is necessary.

a. [3 points] The series \( \sum_{n=1}^{\infty} \frac{(-1)^{n+1}(2x)^{n+1}}{n} \) is a Taylor series centered at \( x = 0 \) for some function \( q(x) \). Which of the following statements are true?

i. The series diverges at \( x = \frac{1}{2} \).
ii. The series diverges at \( x = -\frac{1}{2} \).
iii. \( q(x) \) could be \( 2x \ln(1 + 2x) \).
iv. \( q(x) \) could be \( \ln(1 + 2x) \).
v. The series converges to \( 6 \ln(1 + 6) \) at \( x = 3 \).
vi. The series converges to \( \ln(1 + 6) \) at \( x = 3 \).
vii. NONE OF THESE

b. [3 points] Let \( f(x) \) be a continuous, differentiable function, with \( f(1) = 1 \), \( f'(1) = 2 \). Which of the following must be an antiderivative of \( f'(f(x))f'(x) \) that passes through \((1,3)\)?

i. \( f(f(x)) + 2 \)
ii. \( f'(f(x)) + 1 \)
iii. \( \frac{1}{2} (f(x))^2 + \frac{5}{2} \)
iv. \( 3 + \int_{0}^{x-1} f'(f(t))f'(t)dt \)
v. \( \int_{1}^{x} f'(f(t))f'(t)dt \)
vi. \( 3 + \int_{0}^{x-1} f'(f(t + 1))f'(t + 1)dt \)
vii. \( 3 + \int_{1}^{x} f'(f(t))f'(t)dt \)
viii. NONE OF THESE

c. [3 points] Which of the following functions are solutions to the differential equation \( \frac{d^2 y}{dx^2} + 4y = 0 \)?

i. \( y = 4 \cos(x) \)
ii. \( y = \cos(2x) \)
iii. \( y = \cos(2x) + 4 \)
iv. \( y = 4 \cos(2x) \)
v. \( y = e^{2x} \)
vi. \( y = e^{-2x} \)
vii. NONE OF THESE