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

a. [3 points] The series $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n+1}((2x)^{n+1})}{n}$ 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. $\dfrac{1}{2}(f(x))^2 + \dfrac{5}{2}$

iv. $3 + \displaystyle\int_0^{x-1} f'(f(t))f'(t)dt$

v. $\displaystyle\int_1^{x} f'(f(t))f'(t)dt$

vi. $3 + \displaystyle\int_0^{x-1} f'(f(t+1))f'(t+1)dt$

vii. $3 + \displaystyle\int_1^{x} f'(f(t))f'(t)dt$

viii. NONE OF THESE

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

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