8. [9 points] Zoltan is undergoing an anti-aging skin treatment that involves a machine that uses electrical current to deliver medicine through the skin. During a treatment session, the total amount of medicine that has been absorbed by the skin is a function of the total electrical charge that has entered the skin.
A particular treatment session begins before noon and ends after 12:30 pm, and at noon, Zoltan has already absorbed 4 mg of the medicine.

- Let $m(c)$ be the total amount of medicine, in mg, that has been absorbed when a total electrical charge of c coulombs has entered the skin. Assume that m is invertible and that both m and m^{-1} are differentiable.
- During the treatment, let $q(t)$ be the total electrical charge, in coulombs, that has entered the skin at t minutes after noon. Assume that q is invertible and that both q and q^{-1} are differentiable.

For each of the questions below, circle the one best answer. No points will be given for ambiguous or multiple answers.

a. [2 points] Which of the following expressions represents the total amount of medicine, in mg, that has been absorbed by Zoltan's skin at 12:06 pm?

i. $m(6)$ ii. $\boxed{m(q(6))}$ iii. $m(q(6)+4)$ iv. $m(q(6))+4$
v. $m(6)+4$ vi. $q(m(6))$ vii. $q(m(6)+4)$ viii. $q(m(6))+4$

b. [2 points] Which of the following equations best supports the statement
"Between 12:03 pm and 12:04 pm, Zoltan absorbs about 0.2 mg of the medicine." ?

i. $m(3)=0.2$ ii. $m(q(4))=0.2$ iii. $q'(3)=0.2$
iv. $m'(q(4))=0.2$ v. $m'(3)=0.2$ vi. $q'(4)\cdot m'(4)=0.2$
vii. $m'(q'(3))=0.2$ viii. $\boxed{q'(4)\cdot m'(q(4))=0.2}$ ix. $(q^{-1})'(0.2)=3$

c. [3 points]
Which of the following is the best interpretation of the equation $\displaystyle\int_0^{30} q'(t)\,dt = 200$?

i. $\boxed{\text{Between noon and 12:30 pm, 200 coulombs of electrical charge enter the skin.}}$

ii. Between noon and 12:30 pm, about 200 coulombs of electrical charge enter the skin.

iii. Between noon and 12:30 pm, electrical charge enters the skin at an average rate of 200 coulombs per minute.

iv. Between noon and 12:30 pm, electrical charge enters the skin at an average rate of about 200 coulombs per minute.

d. [2 points] Which of the following equations expresses the statement:
"Between 12:15 pm and 12:25 pm, Zoltan absorbs an additional 7 mg of the medicine."

i. $m(25)-m(15)=7$ ii. $\dfrac{m(25)-m(15)}{10}=7$ iii. $m'(20)=0.7$
iv. $\boxed{\displaystyle\int_{q(15)}^{q(25)} m'(c)\,dc = 7}$ v. $\displaystyle\int_{q(15)}^{q(25)} m(c)\,dc = 7$ vi. $\displaystyle\int_{15}^{25} m(c)\,dc = 7$
vii. $\displaystyle\int_{15}^{25} m(q(t))\,dt = 7$ viii. $\displaystyle\int_{15}^{25} m'(q(t))\,dt = 7$