9. [9 points] For this entire problem assume:

- $f(x)$ is a decreasing function.
- $h(x)$ is a quadratic function.
- $r(x)$ is an exponential function with growth factor $\frac{1}{3}$, satisfying $r(0) > 0$.
- All of the above functions have domain $(-\infty, \infty)$.

a. [4 points] Which of the following COULD be true? Circle all that apply. Unclear answers will be marked incorrect.

(i) The function $f(x)$ is concave up.

(ii) The function $f(x)$ is exponential.

(iii) The function $f(x)$ is quadratic.

(iv) The function $f(x)$ has no $x$-intercepts.

(v) The average rate of change of $f(x)$ between $x = 1$ and $x = 5$ is 1.

b. [3 points] Which of the following MUST be true? Circle all that apply. Unclear answers will be marked incorrect.

(i) The function $h(x)$ has at least one $x$-intercept.

(ii) The average rate of change of $h(x)$ between $x = 1$ and $x = 2$ is less than the average rate of change of $h(x)$ between $x = 2$ and $x = 3$.

(iii) The average rate of change of $r(x)$ between $x = 1$ and $x = 2$ is less than the average rate of change of $r(x)$ between $x = 2$ and $x = 3$.

(iv) $r(-2)$ is positive.

c. [2 points] Compute \( \frac{r(100)}{r(98)} \) in \textbf{exact} form.

\[
\frac{r(100)}{r(98)} = \frac{1}{9}
\]