

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 **exact** form.

$$\frac{r(100)}{r(98)} = \underline{\hspace{2cm}}$$