4. [4 points] Evaluate the following limits. No justification necessary. Write DNE if a limit does not exist or diverges to $\pm\infty$.

i. $\lim_{x\to\infty} \dfrac{(3x^2+1)(x^3-2x+5)}{1-x-x^2-x^3-x^4}$

Answer: DNE

ii. $\lim_{x\to\infty} \dfrac{\ln x}{\sqrt{x}}$

Answer: 0

iii. $\lim_{x\to\infty} \left(\dfrac{xe^{-x}+e^x}{xe^{-x}-e^x}\right)$

Answer: -1

iv. $\lim_{x\to\infty} \dfrac{(3+x^{-1})^2-9}{x^{-1}}$

Solution: If we let $f(x)=x^2$, then this limit is $f'(3)$, which is 6. Alternatively,

$$\lim_{x\to\infty} \frac{(3+x^{-1})^2-9}{x^{-1}} = \lim_{x\to\infty} \frac{9+6x^{-1}+x^{-2}-9}{x^{-1}} = \lim_{x\to\infty} \left(6+x^{-1}\right) = 6.$$

Answer: 6

5. [6 points] A portion of the graph of the differentiable function $f(x)$ is shown below to the right. Using this graph, put the eight quantities (a) through (h) *in order from least to greatest* by writing the letters on the blanks. You are given that $f(x)$ is quadratic on the interval $(2,4)$.

(a) $f'(0)$ (c) $f'(2)$

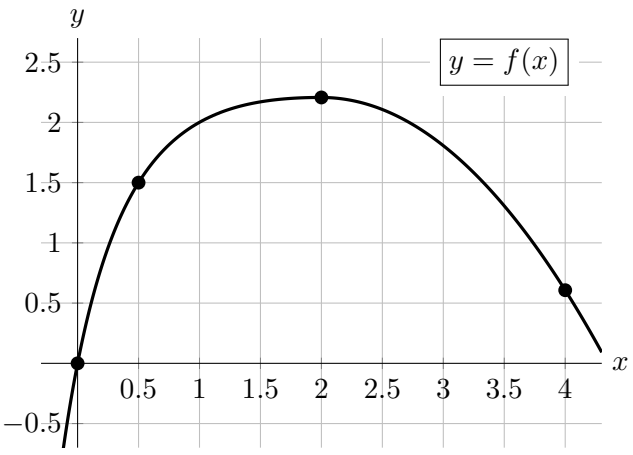
(b) $f'(0.5)$ (d) $f''(3)$

(e) the average rate of change of $f(x)$ over $[0, 0.5]$

(f) the average rate of change of $f(x)$ over $[0.5, 2]$

(g) the average rate of change of $f(x)$ over $[0, 4]$

(h) the number 1



Answer: d , c , g , f , h , b , e , a

LEAST GREATEST