MATH 210: 1/29 WORKSHEET

For the following, determine with the expression is infinitesimal, finite but non-infinitesimal, or infinite. Here ε is infinitesimal, a is positive and finite, and H is positive and infinite.

(1) $3a^2 + 3a\varepsilon + \varepsilon^2$

(2) $\dfrac{3}{\sqrt{\varepsilon}}$

(3) $\dfrac{\sqrt{a+\varepsilon} - \sqrt{a}}{\varepsilon}$

(4) $\sqrt{H+100} - \sqrt{H}$

(5) $\dfrac{3H^2 - H}{H^2 + 4}$

For the following, determine the standard part of the expression, or say why the standard part is undefined. Here ε is infinitesimal, a is positive and finite, and H is positive and infinite.

(1) $3a^2 + 3a\varepsilon + \varepsilon^2$

(2) $\dfrac{3}{\sqrt{\varepsilon}}$

(3) $\dfrac{\sqrt{a+\varepsilon} - \sqrt{a}}{\varepsilon}$

(4) $\sqrt{H+100} - \sqrt{H}$

(5) $\dfrac{3H^2 - H}{H^2 + 4}$

Calculate the following limits. Here a is a positive real number.

(1) $\lim\limits_{x \to 0} 3a^2 + 3ax + x^2$

(2) $\lim\limits_{x \to 0} \dfrac{3}{\sqrt{x}}$

(3) $\lim\limits_{x \to 0} \dfrac{\sqrt{a+x} - \sqrt{a}}{x}$

(4) $\lim\limits_{x \to \infty} \sqrt{x+100} - \sqrt{x}$

(5) $\lim\limits_{x \to \infty} \dfrac{3x^2 - x}{x^2 + 4}$