4. [11 points] The following parts are unrelated.

a. [3 points] Which of the following limits are equal to 0? Circle **all** correct answers.

i. $\lim\limits_{x \to 0} \dfrac{x^3 - 4x + 7}{x^4 + 2x}$

iii. $\boxed{\lim\limits_{x \to \infty} \dfrac{x^2}{e^x}}$

v. $\boxed{\lim\limits_{x \to 0} |x|}$

ii. $\boxed{\lim\limits_{x \to 0} \dfrac{x^4 + 2x}{x^3 - 4x + 7}}$

iv. $\lim\limits_{x \to -\infty} \dfrac{x^2}{e^x}$

vi. NONE

b. [2 points] A dose of a drug is injected into a patient's body. The quantity of the drug remaining in the patient's body decays exponentially at a continuous rate of 5% per hour. Which of the following functions could represent the percentage of the original dose which is still remaining in the patient's body after t hours? Circle **the one best** answer.

i. $100e^{0.05t}$

iii. $100e^{0.95t}$

v. $100(1 - e^{0.05t})$

ii. $100e^{1-0.05t}$

iv. $\boxed{100e^{-0.05t}}$

vi. NONE

c. [3 points] The linear approximation to the function $P(x)$ at $x = 1$ is given by $L(x) = e(x-1) + \frac{1}{2}$. Which of the following could be a formula for $P(x)$? Circle **all** correct answers.

i. $\boxed{P(x) = e(x - 1) + \frac{1}{2}}$

iv. $\boxed{P(x) = \sin(e(x - 1)) + \frac{1}{2}}$

ii. $P(x) = \frac{1}{2} + e^x$

v. $P(x) = \cos(e(x - 1)) - \frac{1}{2}$

iii. $\boxed{P(x) = e^x + \frac{1}{2} - e}$

vi. NONE

d. [3 points] A company sells their product for \$5 per unit, and their fixed cost of production is \$2000. If their cost function, in dollars, to produce q units is $C(q)$ and their marginal cost function is $MC(q)$, which of these expressions represents the total profit generated from producing 1000 units of their product? Circle **all** correct answers.

i. $\boxed{5000 - C(1000)}$

iv. $2000 + \displaystyle\int_0^{1000} (5 - MC(q))\, dq$

ii. $5 - MC(1000)$

v. $\displaystyle\int_0^{1000} (5q - C(q))\, dq - 2000$

iii. $\boxed{3000 - \displaystyle\int_0^{1000} MC(q)\, dq}$

vi. NONE