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

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

iii. $\lim_{x\to \infty} \dfrac{x^2}{e^x}$

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

v. $\lim_{x\to 0} |x|$

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. $100e^{0.05t}$

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

iii. $100e^{0.95t}$

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

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

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

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

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

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

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

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. $5000-C(1000)$

ii. $5-MC(1000)$

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

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

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

vi. NONE