10. [11 points] In each situation, circle all of the statements I-VI which must be true. If none of the statements must be true, circle VII. NONE OF THE ABOVE.

a. [3 points] Let $f(x) = qe^{rx} + s$, where q, r, and s are negative constants.

I. $f(0) > 0$

II. $f'(0) > 0$

III. $\lim_{x\to\infty} f(x) = s$

IV. $\lim_{x\to\infty} f(x) = 0$

V. $\lim_{x\to-\infty} f(x) = s$

VI. $\lim_{x\to-\infty} f(x) = 0$

VII. NONE OF THE ABOVE

b. [4 points] Let $g(x) = a\ln(bx)$, where a and b are positive constants.

I. The domain of $g(x)$ is the interval $(0, \infty)$.

II. The graph of $g(x)$ has a horizontal asymptote.

III. The graph of $g(x)$ has a vertical asymptote.

IV. $g^{-1}(0) = b^{-1}$

V. $g'(x) = \dfrac{a}{bx}$

VI. $\displaystyle\int g(x)\,dx = ax(\ln(bx) - 1) + C$

VII. NONE OF THE ABOVE

c. [4 points] Let $z(t) = A\sin t + B$, where A and B are positive constants.

I. The maximum value of $z(t)$ on its domain is $A + B$.

II. $z(t)$ has an inflection point at $t = 0$.

III. If $h(t) = z(z(t))$, then $h'(0) = A^2\cos B$.

IV. $\displaystyle\int_0^{2\pi} z(t)\,dt = 0$

V. $\displaystyle\int_0^{\pi} z(t)\,dt = 2A + \pi B$

VI. $\displaystyle\int_1^2 z(t)\,dt = \int_{1+2\pi}^{2+2\pi} z(t)\,dt$

VII. NONE OF THE ABOVE