CLASS QUIZ: NOVEMBER 28: LOGARITHM AND EXPONENTIAL

MATH 152, SECTION 55 (VIPUL NAIK)

Your name (print clearly in capital letters): ____

Note: I didn't administer this quiz last year, so I don't have data on the level of difficulty of the questions. Thus, the starring of questions is based on guesswork.

(1) Consider the function $f(x) := \exp(5 \ln x)$ defined for $x \in (0, \infty)$. How does $f(x)$ grow as a function of x?
(A) As a linear function
(B) As a polynomial function but faster than a linear function
(C) Faster than a polynomial function but slower than an exponential function
(D) As an exponential function, i.e., $x \mapsto \exp(kx)$ for some $k > 0$
(E) Faster than an exponential function

Your answer: ____________________________

(2) Consider the function $f(x) := \ln(5 \exp x)$ for $x \in (0, \infty)$. How does $f(x)$ grow as a function of x?
(A) As a linear function
(B) As a polynomial function but faster than a linear function
(C) Faster than a polynomial function but slower than an exponential function
(D) As an exponential function, i.e., $x \mapsto \exp(kx)$ for some $k > 0$
(E) Faster than an exponential function

Your answer: ____________________________

(3) Consider the function $f(x) := \ln((\exp x)^5)$ defined for $x \in (0, \infty)$. How does $f(x)$ grow as a function of x?
(A) As a linear function
(B) As a polynomial function but faster than a linear function
(C) Faster than a polynomial function but slower than an exponential function
(D) As an exponential function, i.e., $x \mapsto \exp(kx)$ for some $k > 0$
(E) Faster than an exponential function

Your answer: ____________________________

PLEASE TURN OVER FOR REMAINING QUESTIONS

(4) (*) Consider the function $f(x) := \exp((\ln x)^5)$ defined for $x \in (0, \infty)$. How does $f(x)$ grow as a function of x?
(A) As a linear function
(B) As a polynomial function but faster than a linear function
(C) Faster than a polynomial function but slower than an exponential function
(D) As an exponential function, i.e., $x \mapsto \exp(kx)$ for some $k > 0$
(E) Faster than an exponential function

Your answer: ____________________________

(5) (*) *Consumption smoothing*: A certain measure of happiness is found to be a logarithmic function of consumption, i.e., the happiness level H of a person is found to be of the form $H = a + b \ln C$ where C is the person's current consumption level, and a and b are positive constants independent of the consumption level.

The person has a certain total consumption C_{tot} to be split within two years, year 1 and year 2, i.e., $C_{tot} = C_1 + C_2$. Thus, the person's happiness level in year 1 is $H_1 = a + b \ln C_1$ and the person's happiness level in year 2 is $H_2 = a + b \ln C_2$. How would the person choose to split consumption between the two years to maximize average happiness across the years?
(A) All the consumption in either one year
(B) Equal amount of consumption in the two years
(C) Consume twice as much in one year as in the other year
(D) Consumption in the two years is in the ratio $a : b$
(E) It does not matter because any choice of split of consumption level between the two years produces the same average happiness

Your answer: ____________________________

(6) (*) *Income inequality and subjective well being*: Subjective well being *across* individuals is found to be logarithmically related to income. Every doubling of income is found to increase an individuals' measured subjective well being by 0.3 points on a certain scale. *Holding total income across two individuals constant*, how should that income be divided between the two individuals to maximize their average subjective well being?
(A) All the income goes to one person
(B) Both earn the exact same income
(C) One person earns twice as much as the other
(D) One person earns 0.3 times as much as the other
(E) It does not matter because the average subjective well being is independent of the distribution of income.

Your answer: ____________________________