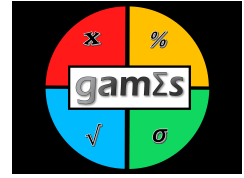


GAMES Course 1 Final Exam



Multiple-Choice

- How many trees can be planted in a tract of land 10m wide and 15m long if the trees have to be spaced 1m apart?
 - 10 X 16
 - 11 X 16
 - 12 X 16
 - 10 X 16
- Which of the following is an example of a geometric sequence?
 - 1, 10, 20, 30, 40,
 - 1, 10, 100, 1000, 10000,
 - 1, 4, 9, 16, 25,
 - 1, 10, 50, 100, 150,
- If you wish to add up only numbers which satisfy a certain criteria, which in-built function in Excel would you use?
 - SUMIF
 - MAXIF
 - MINIF
 - AVERAGEIF
- In order to make $f(x)$ close to L , what are we requiring x to get close to $f(x) = \lim_{x \rightarrow a} = L$?
 - L
 - $f(x)$
 - a
 - $f(a)$
- For the power rule to apply, what has to be true about the power?
 - Nothing, it can be any number
 - It can be a positive or negative integer
 - It has to be a real number
 - It has to be a positive integer
- What is the limit as $x \rightarrow \infty$ of 2?
 - 0

- (b) 2
 - (c) $-\infty$
 - (d) ∞
7. $(p(a+h) - p(a))/h$ is the slope of the
- (a) tangent line at $t = a$
 - (b) tangent line at $t = a + h$
 - (c) secant line through $(a, p(a))$ and $(a + h, p(a + h))$
 - (d) secant line through $(p(a), a)$ and $(p(a + h), a + h)$
8. The first step to using implicit differentiation is to
- (a) calculate the value of y using x .
 - (b) calculate the value of x using y .
 - (c) recognize that y is an implicit function of x .
 - (d) * re-arrange so x is isolated on one side of the expression.
9. $f = x^2v(x)$ where v is a function, then
- (a) * $\frac{df}{dx} = 2xv(x) + x^2v'(x)$
 - (b) $\frac{df}{dx} = 2xv'(x)$
 - (c) $\frac{df}{dx} = x^2v'(x)$
 - (d) $\frac{df}{dx} = xv(x) + x^2v'(x)$
10. If $a \in X$ is a global maximum on f , then
- (a) $f(a) > f(x)$ for some x .
 - (b) $f(x) > f(a)$ for all a .
 - (c) $f(x) < f(a)$ for some a .
 - (d) $f(a) > f(x)$ for all x .

Short Answer Questions

1. A firm XYZ Inc. uses three inputs X , Y and Z to produce an output I according to the formula: $I = 2\sqrt{X} + 4\sqrt{Y} + \sqrt{Z}$. This is an example of a production function, a concept that is commonly used in economics and business.
 - (a) If it uses 4 units of X , 16 units of Y and 9 units of Z , how much I will it produce?
 - (b) Suppose it doubles its inputs to 8 units of X , 32 units of Y and 18 units of Z , how much I will it produce?
 - (c) If it already has 8 units of X and 32 units of Y , how many units of Z will it need to produce 50 units of I ?

2. Consider a model of infection spread. Suppose each person interacts with N people each day. If a person is infected, the chance of him/her spreading it to a person that he/she meets is p . Thus on average, an infected person will spread the infection to pN persons.

Assume for simplicity that an infected person is contagious for only 1 day i.e. stops spreading it after 1 day.

- (a) If 1 infected person enters a population today without any previous infection, how many people are likely to be infected in 1 day, and in t days?
- (b) If 10 infected persons entered the population today which didn't have any previous infections, how many people are likely to be infected in 1 day, and in t days?
- (c) Starting from 10 infections, compute how many infections there are likely to be in 5 days if $p = 0.1$ and $N = 20$.
3. Find the following sums.
- (a) $1 + 2 + 3 + 4 + \dots + 80$
- (b) $1 + \frac{1}{2} + (\frac{1}{2})^2 + (\frac{1}{2})^3 + (\frac{1}{2})^4$
4. Kim goes to a physiotherapist, who asks him to increase his weight-training regimen gradually over time to rebuild his strength. He asks Kim to start with 2 lbs on day 1, and then increase it by 20% every day.
- (a) If Kim were to follow this regimen, how much weight would he be lifting on day 5 and on day t ?
- (b) How much total weight would he have lifted over 10 days? Write this as a sum of 10 terms and also using the summation notation.
- (c) Evaluate the total weight Kim would have lifted over 10 days.
5. Find linear approximations of y about $x = 0$ for the following.

(a) $y = (1 - x)^{1/6}$

(b) $y = (5x + 3)^{-2}$

6. Supply-Demand Model with a Tax – Consider a linear supply and demand model where consumers pay a tax of τ per unit.

$$D = a - 500(P + \tau) \qquad S = \alpha + 100P$$

a and α are positive constants. The equilibrium price is found when supply equals demand:

$$a - 500(P + \tau) = \alpha + 100P$$

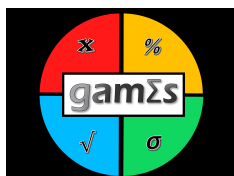
- (a) Solve the above for Price, P .
- (b) When the tax rate increases, does the price, P , increase or decrease? Use implicit differentiation to find $\frac{dP}{d\tau}$ and interpret your results.

7.

$$f(x) = \frac{32x}{2x^2 + 1}$$

- (a) Find all critical points. Assume the domain includes $-\infty \leq x \leq \infty$.

- (b) Use the first derivative test and a sign diagram to evaluate all critical points.
- (c) Use the second derivative test to verify your result in part 7b.
8. Dosage for drugs, D , is measured in milligrams (mg) and depends on a patient's weight, W in kilograms (kg). The function of this relationship is: $D = f(W)$
- (a) Express the relationship $f(60) = 40$ in a sentence with units.
- (b) Express the relationship $f'(60) = 6$ in a sentence with units.
- (c) Estimate the dosage for a 65 kg person.



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