STAPLE

Version A

PRINT NAME

TaSDi

Math 34B Winter 99 Final
Prof Cooper **4pm-7pm**
Wens Mar 24

Quality Bonus /4

SCORE /72

No Calculators

Put final answers in boxes on this page.**SHOW WORK** for **ALL QUESTIONS**. Put **high quality** work in the blue book. Points are awarded for this.**Number your solutions in the blue book** . At the end of the exam STAPLE this page to the INSIDE front blue cover of the blue book, so that this side faces the white writing pages of the blue book. If you used a 3"x5" card, his MUST also be stapled here, behind this page.**Put away your photo ID after we check it.**

(1) [/6] Find the integrals

(a) $\int 3x(x+2)\ dx$

(b) $\int_0^3 (3t + 2e^{4t})\ dt$

(c) $\int_1^2 (5/x^2)\ dx$

(2) [/6] $f(x,y) = 2x\,y^2 + 5x - 7y + 3$
Find the following partial derivatives

(a) f_x

(b) f_y

(c) f_{yx}

(3) [/6] A plane flies along a route 2000 miles long. It flies at 200mph for the first and last half hour of the flight. It flies at a higher constant speed for the rest of the flight. The plane is 1000 miles from the starting point after 2 hours of flying. How many hours is the entire flight?

hours

(4) [/6] A rectangular water tank has a square base. The length of a side of the base of the tank is 3 meters. Initially the water tank is empty. Water enters the tank at a rate of 2000 liters per hour. [there are 1000 liters in a cubic meter]

(a) what is the height of water in the tank after t hours

meters

(b) How quickly is the water level in the tank rising

meters/hour

(5) [/6] Due to over-fishing, the number of fish in a lake dropped to 2000, then fishing stopped. t years after fishing had stopped the number of fish in the lake was increasing at a rate of 300+200t fish per year.

(a) How many fish are in the lake after t years?

(b) How many years after fishing stopped was it until the number of fish in the lake reach 3800

years

(6) [/6] Find the local maximum and minimum of the function below. Show**clearly** how you use the second derivative test.

$f(x) = -x^3 + 12x + 5$

local minimum is ____ when x=

local maximum is ____ when x=

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(7) [/6] A colony of bacteria is growing at a rate equal to 0.3 times its mass. Here time is measured in hours and mass is measured in grams. There was 5 grams of bacteria after 3 hours.

(a) Write down the differential equation that the mass of bacteria satisfies.

(b) What was the mass of bacteria after t hours.

(c) How quickly was the mass increasing after 6 hours

(8) [/6] A steel bar is initially at a temperature of 550 ^{o}C and cools down according to Netwon's law of cooling. The temperature of the surroundings is 50 ^{o}C. Initially the steel bar is cooling at a rate of 20 ^{o}C per minute.

(a) write down the differential equation that governs the temperature of the steel bar.

(b) What was the temperature after 20 minutes

(c) carefully draw a sketch graph showing the temperature over a long period.

(9) [/6] Rabbits are introduced onto an island. The population of rabbits is described by the logisitc equation. Initially there were 200 rabbits and this number was increasing at a rate of 20 per month. The maximum number of rabbits the island can support is 2000.

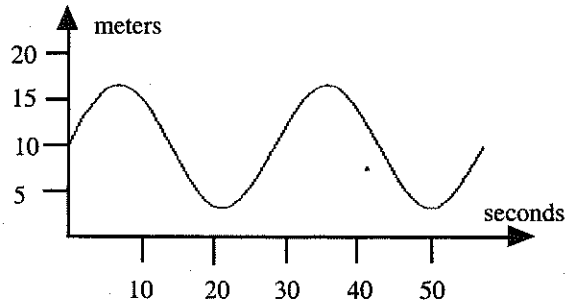
(a) What is the differential equation which the number of rabbits satisfies?

(b) What was the rate of increase of the number of rabbits when the rabbit population was 1000

(c) approximately how many rabbits are there after 1000 years

(10) [/6] (a) Sketch the slope field for $y' = y+t$ for y and t in the range from -2 to 2 using a grid spacing of 1 in each direction.
(b) sketch the solution curve for which y(-1)=1 and label it.
(c) sketch the solution curve for which y(-1)=-1 and label it.
(d) what is the long term behaviour of the solution curve in (b)

(11) [/6]



(a) what is the amplitude of the sine wave shown meters

(b) What is the frequency of the sine wave shown hertz

(c) what is the formula of the sine wave shown

(12) [/6] A rectangle has an initial width of 30cm and a length of 20cm. The area is increasing at a rate of 40 cm^2 per minute. The width is increasing at a rate of 3 cm per minute. What is the rate of change of the length ? cm/minute