Group Exam 1

Name: _____

Math 142

Name of group member: _____

Professor Johnson

Name of group member: _____

Problem 1: In this problem you will use the definition of the integral to evaluate an integral.

$$\int_0^4 3 - x^2 \, dx = \lim_{n\to\infty} \left[\sum_{i=k}^{n} f(x_k^*)\Delta x \right]$$

Begin by drawing the graph of $f(x) = 3 - x^2$.

Fill in the blanks.

$\Delta x =$ _____ $x_k =$ _____

Using right hand endpoints for x_k^*, we have $f(x_k) =$ _____

Next simplify the following sum to a formula that is a function of n (w/o summation notation).

$$\sum_{k=1}^{n} f(x_k)\Delta x =$$

Next, using the formula you found above, calculate the limit,

$$\lim_{n\to\infty} \left[\sum_{k=1}^{n} f(x_k)\Delta x \right] =$$

Hence, $\int_0^4 3 - x^2 \, dx =$

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Problem 2a: Identify the limit below as an integral and evaluate it.

$$\lim_{n\to\infty}\left[\sum_{k=1}^{n}\left(2\left(\frac{5\cdot k}{n}\right)+1\right)^{7}\frac{5}{n}\right]$$

Problem 2b: Your friend shows you the following calculation.

$$\int_{-2}^{2}\frac{1}{x^2}\,dx=\int_{-2}^{2}x^{-2}\,dx=\left(-x^{-1}\right]_{-2}^{2}=-\frac{1}{2}-(-\frac{1}{-2})=-1$$

Your friend then says "But wait.... I think the function $f(x)=\frac{1}{x^2}$ is always positive, which means an answer of -1 isn't right." Explain why your friend knows the answer is incorrect. Then find and explain the error in your friend's calculation.

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Problem 3: The reproduction rate for a population of weavils is measured and the values are given in the following table.

time, t (in weeks)	growth rate (in weavils/ week)
0	7
5	14
10	28
15	56

Find a formula, $R(t)$, that models the growth rate in the weavil population over the time interval $0 \leq t \leq 15$ weeks.

$R(t) =$

Assuming this model remains accurate into the near future, find the growth rate in week 18. Include units in your answer.

Use the model function $R(t)$ to determine how may weavils are born over the time period $0 \leq t \leq 18$ weeks.

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