

ID Number: Candidate's signature:

Examination Location:



UNIVERSITY OF GHANA
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UNIVERSITY OF GHANA
FACULTY OF ENGINEERING SCIENCES

Second SEMESTER EXAMINATIONS, 2013/2014

LEVEL 100: BACHELOR OF SCIENCE IN ENGINEERING

FAEN 102: CALCULUS 1

TIME ALLOWED: THREE (3) HOURS

Instructions:

1. Answer All questions in the space provided on the Question paper
2. Calculators allowed
3. Graph paper provided below.

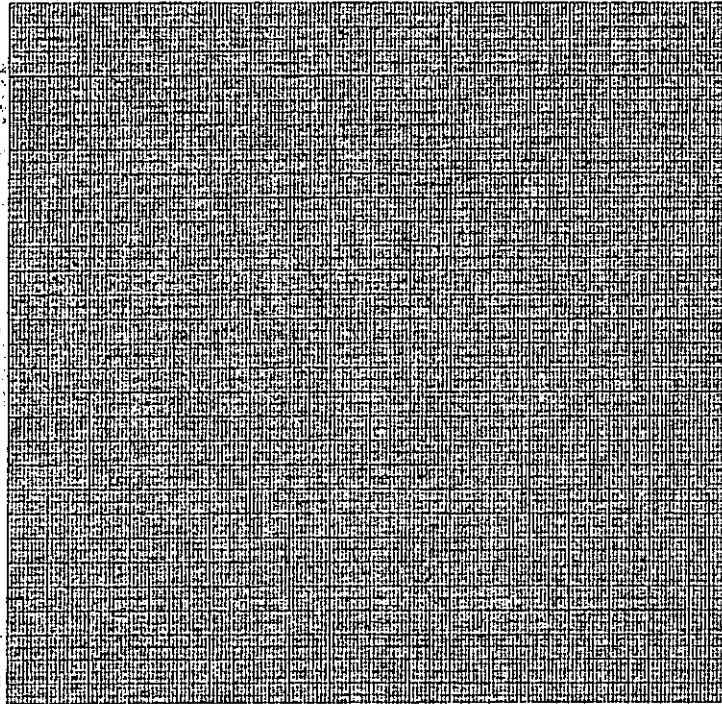
1. (a) $F(x) = \frac{(x^3+1)(x-1)}{x+1}$ for $x \neq -1$ find the limit of $F(x)$ as x approaches -1^- and -1^+ using the table of values below

x	-0.75	-0.9	-0.99	-0.999	-1	-1.0001	-1.001	-1.01	-1.1	-1.25
F(x)										

Sketch the graph of the function and find the point where the graph cuts the x axis.

- (b) Find the following limit: $\lim_{x \rightarrow 1} \frac{|x-1|}{x-1}$

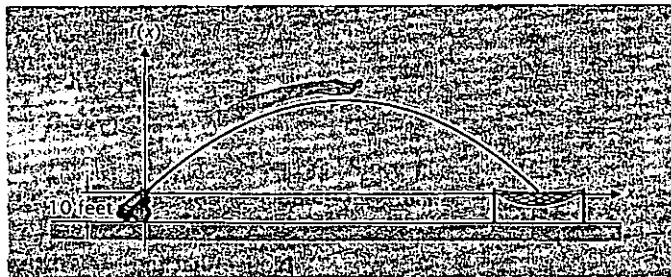
- (c) Study and sketch the graph of the function $f(x) = \frac{-x^2-x+6}{(x+2)(x-3)}$



2. The trajectory of a circus performer shot from a cannon is given by the graph of the function

$$f(x) = x - \frac{1}{100}x^2$$

Both the cannon and the net are 10 feet high (see figure).



- A. How far from the muzzle of the cannon should the center of the net be placed so that the performer lands in the center of the net?
- B. What is the maximum height of the performer above the ground?

[illegible]

3. $K(x) = x^2 e^x - 5$ is given. Sketch the graph and label it as $K(x)$ and find the x-intercept for $0 < x < 1$ using the method of Newton-Raphson which states (formula only):

$$X_n = \dots$$
$$x_1 = 1 \quad x_2 = \dots \quad x_3 = \dots \quad x_4 = \dots \quad x_5 = \dots$$

$x_6 = \dots\dots\dots x_7 = \dots\dots\dots x_8 = \dots\dots\dots x_9 = \dots\dots\dots$

Determine the area between the graph and the limits of x: 0-1 for n=8 using:

- i. the trapezoidal method (give the formula):.....

[illegible]

- j. the Simpson's method (give the formula):

[illegible]

k. the direct integration $\int_0^1 (x^2 e^x - 1) dx$

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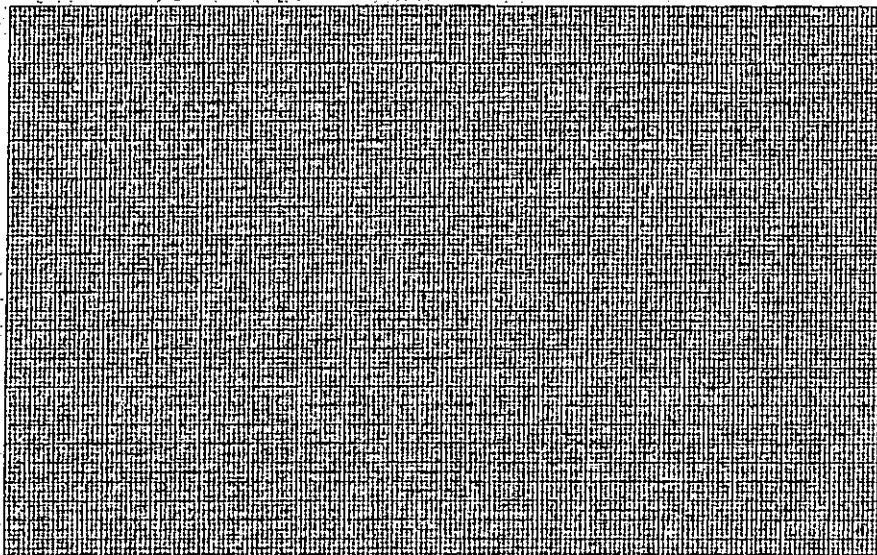
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4. Find the derivative of the following

a. using the limit process:

$$F(x) = 7x^5$$

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• $F(x) = \sin^3 x$

ii. $F(x) = X^{x+1} e^{x^2+x+2} (x^3 + \sin x + e^{2x})$

iii. $F(x) = 5x + \cos^2 x$

iv. $F(x) = \tan 2\frac{\pi}{3} + \cos x$

5. Find the integral of the following

a. $\int x^2 \cos x \, dx$

b. $\int \frac{3x}{x^2+2x-8} dx$

c. $\int \sin 2x \, dx$

d. $\int \sin^4 x \, dx$

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.