QUESTION 1: (Start a new page)

- (a) Evaluate $\lim_{x\to 0} \frac{\sin^3 x}{2x}$
- (b) Express $\log \left(\frac{x^3 y^2}{\sqrt{z}} \right)$ in terms of a, b and z if $\log x = a$, $\log y = b$, and $\log z = c$.
- (c) For the function $y = 2\sin^{-1}\left(\frac{x}{3}\right)$ state the:
 - (i) Domain
 - (ii) Range
 - (iii) Draw a neat sketch of the curve: $y = \frac{3}{3}\sin^4\left(\frac{x}{3}\right)$
- (d) Find all values of θ (in radians) if $\sqrt{3}\sin\theta \approx \cos\theta$

QUESTION 2: (Start a new page)

- (a) If $y = 10^{\circ}$, find $\frac{dy}{dx}$ when x = 1
- (b) Evaluate in terms of $\pi = \int_0^1 \frac{dx}{x^2 + 3}$.
- (c) From eight teachers and six pupils a committee of seven is to be formed. How many committees can be selected if both teachers and pupils are represented and the teachers are in the major ty?
- (d) Given that $y = \sin^{-1}(x^2)$, find $\frac{d^2y}{dx^2}$

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QUESTION 3: (Start a new page)

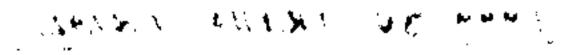
- (a) A manufacturer produces computer components of which 35% are found to be satisfactory. From a sample of 10 components:
 - (t) Find the probability that at most 1 fails to meet the specification.
 - (ii) At least 2 are unsatisfactory.

Give your unswer; to past (i) and (ii) correct to 2 desimal places.

- (b) A vessel is being filled at a variable rate $\frac{dV}{dt} = k(A V)$ where k and A are constants.
 - (i) Show that $V = A | (-e^{-kt})$ is a solution of the differential equation above.
 - (n) Find the capacity of the vessel.
 - (iii) Find the value of k if $\frac{1}{8}$ of the vessel is filled in 6 minutes
 - (iv) Find the fraction of the vessel filled in the next 6 m nutes,

QUESTION 4: (Start a new page)

- (a) The velocity (Vms^{-1}) of a body moving in a straight line is given by $|V| = e^{t} e^{t}$ where t is the time in seconds. If its initial position is at the origin
 - Find the equation relating x (the displacement from O) and t.
 - (ii) Find the initial acceleration.
 - (iii) Show that the boxly does not have a maximum velocity.
 - (iv) Find the time taken to reach a point 3m to the right of the origin. Give your answer correct to 1 decimal place.
- (b) The region enclosed by the curve $y = \tan x$, the x axis and the ordinate $x = \frac{\pi}{4}$ is rotated about the x-axis. Using Simpson's Rule with 5 function values, find an approximate value (to 1 dec. pf.) for the volume of the solid formed



QUESTION 5: (Start a new page)

- (a) A spherical balloon is being inflated. When the radius of the balloon is dems its volume is increasing at the rate of 100cm³/sec. Find the rate at which its surface area is then increasing.
- (b) (i) Find the equation of the tangent to the curve $y = \frac{x+1}{x^2+3}$ at the point where the curve cuts the x exis
 - (ii) Show that the tangent meets the curve again at a point where the function has a stationary point.

() UESITION (i: (Start # ### page)

- (a) Use the substitution $u = \sin x$ to evaluate the integral $\int \cos^3 x \ dx$.
- (b) When $(3+2x)^n$ is expended as a polynomial in x, the coefficients of x^5 and x^6 have the same value. Find the value of n.
- (c) Prove by induction that $\cos(x + n\pi) = (-1)^n \cos x$ for integer $n \ge 1$

QUESTION ": (Start a new page)

- (a) Ron put \$500 savings into a Bank for 2 years, where it earned interest at 6% p.a., paid twice a year. He then changed to a Credit Union and his money earned 8% p.a., paid quarterly. If he withdrew all his savings, and had \$633.75, how long was the money kept in the Credit Union?
- (b) A boy throws a ball vertically and it just reaches a height of 40 metres. What is the greatest distance that he is able to throw it on a horizontal plane? (Let $g \approx 10 ms^2$)

END OF PAPER

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DUESTION!

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(b) 3a +26-2c

(c) (i) D - - 3 = x = 3

(11) R -11 5y 5TT

(d) nTT+E, namintage

QUESTION 2

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(b) <u>T</u>

(c) \$ 6 + 85.6 + 46.6

(d) 2(1+x4) (1-x4) 1/2

Q. ESTIG. 3

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(ii) = 0 4k

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QUESTION 4

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(ii) is = et + e-t

(iii) tom, von

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= 1.6

(b) v ≠ 0.7 u3

QUESTION 5

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(b)(i) x-49+1=0 (11) double my 7-1,0)

QUESTION 6

(a) sink - { sin3 x + c

19 n=14

(c) —

QUESTION 7

lay n = 1.5 gm

16, 80 m.