University of Guyana
Faculty of Technology
EMT111 Final Examination
(practice)

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Directions: Answer all questions. Show all work. Calculators are allowed. Note: This is a practice test only. The actual test has a similar structure.

1. Evaluate.

   (a) $\log_4 64$ (b)$\log 4 + \log 25$ (c) $(3x^3 + x - 1) \div (x - 2)$

2. Solve for x.

   (a) $\log_2 x = \log_4(x^2 - 6)$ (b) $x^2 + 2x - 8 \leq 0$ (c) $2^{x-2} = 10$

3. Compute the derivative of the following functions.

   (a) $f(x) = \frac{\sin x - \cos x}{e^x}$

   (b) $f(x) = \sin x \cos x$

   (c) $f(x) = \frac{x}{x^3+1}$

   (d) $s(x) = \arcsin(x^3)$

   (e) $g(t) = t^2(t + 4)$

4. Evaluate the following integrals.

   (a) $\displaystyle\int_1^4 \sqrt{4x}\,dx$

   (b) $\displaystyle\int \frac{dx}{5x-3}$

   (c) $\displaystyle\int \frac{dx}{x^2\sqrt{x^2-9}}$

   (d) $\displaystyle\int \frac{x^3}{\sqrt{x^2+9}}\,dx$

   (e) $\displaystyle\int_0^{2\sqrt{3}} \frac{x^3}{\sqrt{16-x^2}}\,dx$

   (f) $\displaystyle\int \frac{dx}{(x^2+2x+2)^2}$

   (g) $\displaystyle\int x^5 e^{x^2}\,dx$

   (h) $\displaystyle\int e^{(\ln x + x^2)}\,dx$

   (i) $\displaystyle\int \frac{4x-2}{(x+2)(x-1)}\,dx$

   (j) $\displaystyle\int x\ln x\,dx$

   (k) $\displaystyle\int \tan x \sec^2 x\,dx$

5. Find the absolute minimum and maximum values of the function $f(x) = x^3 - 3x + 7$ on the interval $[-2, 0]$.

6. (a) A plane is first sighted at a point A due east from an observer at an angle of 30^o from the ground and at an altitude of 1000 ft. The plane is next sighted at a point B due east at an angle of 60^o and an altitude of 2000 ft. What is the distance from A to B?

   (b) Prove:
   $$\frac{\cos x}{1-\sin x} - \tan x = \frac{1}{\cos x}$$

   (c) Trig. Problem

7. Storage bin problem.

8. Applied volume of solids of revolution problem.

9. Applied simultaneous equation problem.

GOOD LUCK

SELECTED ANSWERS:

1. (a) 3 (b) 2 (c) $3x^2 + 6x + 13$ and 25 rem

2. (a) No solution (b) $x \in (-4, 2)$ (c) 5.32

3. (a) $\frac{2\cos x}{e^x}$ (b) $\cos 2x$ (c) $\frac{1-2x^3}{(x^3+1)^2}$ (d) $\frac{3x^2}{\sqrt{1-x^6}}$ (e) $3x^2 + 8x$

4. (a) 28/3 (b) $\frac{1}{5}\ln|5x-3| + c$ (i) $\frac{10}{3}\ln|x+2| + \frac{2}{3}\ln|x-1| + c$
(j) $\frac{x^2}{2}\ln x - \frac{x^2}{4} + c$ (k) $\frac{\tan^2 x}{2} + c$

5. absolute min = 5, absolute max = 9

6. (a) 1155 ft (b) LHS $= \frac{\cos x}{1-\sin x} - \tan x = \frac{\cos x}{1-\sin x} - \frac{\sin x}{\cos x} = \frac{\cos^2 x - \sin x(1-\sin x)}{(1-\sin x)(\cos x)} = \frac{\cos^2 x - \sin x + \sin^2 x}{(1-\sin x)\cos x} = \frac{1-\sin x}{(1-\sin x)\cos x} = \frac{1}{\cos x} =$ RHS