

ENGINEERING MATHEMATICS 1 (MATH 1048)

MATLAB TEST S2, 2005

Time: 45 minutes

Surname ..... Other Names ..... Student ID .....

Students may only refer to *A Focussed Introduction to MATLAB*. Calculators and any other reference material are not allowed. You may use the back of this page for working. You are advised to type "CLEAR ALL" to remove everything from previous unrelated questions.

1. If  $x = 1.03$ , evaluate  $y = \frac{5 - \cos x}{x^2 \sqrt{4 + \tan x}}$ .

ANSWER .....

2. The **range** of the function  $f(x) = \frac{3x - 1}{x^2 + \cos x}$  is of the form  $[a, b]$ . Give  $a$  and  $b$  correct to two decimal places.

ANSWER .....

3. If  $f(x) = (x^3 + 1)^{\frac{1}{3}}$ , find the second derivative and simplify.

ANSWER .....

4. At what point  $(x, y)$  does  $y = x^3$  intersect  $y = \cos 2x$ ? (Give  $x$  and  $y$  to 4 decimal places.)

ANSWER .....

5. Use ZOOM ON to find  $\lim_{x \rightarrow 1} \frac{4^{x-1} - 1}{x^2 - 1}$  correct to 4 decimal places.

ANSWER .....

6. Determine the definite integral  $\int_0^\pi \sin^4 x \, dx$ .

ANSWER .....

7. If  $a_k = k \cos(k - 10)$ , find the maximum  $|a_k|$  for  $k = 1$  to  $k = 200$ . (Note the absolute value sign.)

ANSWER .....

8. Evaluate  $\sum_{i=1}^{80} \frac{1}{2 + \sqrt{i}} = \frac{1}{2 + \sqrt{1}} + \frac{1}{2 + \sqrt{2}} + \frac{1}{2 + \sqrt{3}} + \dots + \frac{1}{2 + \sqrt{80}}$ .

ANSWER .....

9. What is the first integer  $n$  such that

$$\sum_{i=1}^n \frac{1}{2 + \sqrt{i}} = \frac{1}{2 + \sqrt{1}} + \frac{1}{2 + \sqrt{2}} + \frac{1}{2 + \sqrt{3}} + \dots + \frac{1}{2 + \sqrt{n}} > 20?$$

ANSWER .....

10. Use SIMPLE to find a simpler trigonometric expression for  $f(x) = \frac{1}{\sec x + \tan x} + \tan x$ .

ANSWER .....

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1. If  $x = 1.45$ , evaluate  $y = \frac{3x^2 + 1}{x\sqrt{2} + \sin x}$ .

ANSWER .....

2. The **range** of the function  $f(x) = \frac{3x - 1}{x^2 + \cos x}$  is of the form  $[a, b]$ . Give  $a$  and  $b$  correct to two decimal places.

ANSWER .....

3. If  $f(x) = (x^{0.4} + 1)^{2.5}$ , find the second derivative and simplify.

ANSWER .....

4. At what point  $(x, y)$  does  $y = x^3$  intersect  $y = 1 + \sin x$ ? (Give  $x$  and  $y$  to 4 decimal places.)

ANSWER .....

5. Use ZOOM ON to find  $\lim_{x \rightarrow 0.5} \left( \tan \left( \frac{\pi x}{2} \right) \right)^{\tan \pi x}$  correct to 4 decimal places.

ANSWER .....

6. Determine the definite integral  $\int_0^\pi x^2 \cos x \, dx$ .

ANSWER .....

7. If  $a_k = \frac{1}{k} \tan k$ , find the maximum  $|a_k|$  for  $k = 1$  to  $k = 200$ . (Note the absolute value sign.)

ANSWER .....

8. Evaluate  $\sum_{i=1}^{80} \frac{1}{1 + \sqrt{i}} = \frac{1}{1 + \sqrt{1}} + \frac{1}{1 + \sqrt{2}} + \frac{1}{1 + \sqrt{3}} + \dots + \frac{1}{1 + \sqrt{80}}$ .

ANSWER .....

9. What is the first integer  $n$  such that

$$\sum_{i=1}^n \frac{1}{1 + \sqrt{i}} = \frac{1}{1 + \sqrt{1}} + \frac{1}{1 + \sqrt{2}} + \frac{1}{1 + \sqrt{3}} + \dots + \frac{1}{1 + \sqrt{n}} > 20?$$

ANSWER .....

10. Use SIMPLE to find a simpler trigonometric expression for  $f(x) = 3 + 4 \cos 2x + \cos 4x$ .

ANSWER .....

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1. If  $x = 0.88$ , evaluate  $y = \frac{\sqrt{3 - \sin x}}{x^2(2 + \tan x)}$ .

ANSWER .....

2. The **range** of the function  $f(x) = \frac{7x + \sin x}{x^2 + x + 2}$  is of the form  $[a, b]$ . Give  $a$  and  $b$  correct to two decimal places.

ANSWER .....

3. If  $f(x) = (x^4 + 1)^{\frac{1}{4}}$ , find the second derivative and simplify.

ANSWER .....

4. At what point  $(x, y)$  does  $y = x^3$  intersect  $y = 3 \cos x + 1$ ? (Give  $x$  and  $y$  to 4 decimal places.)

ANSWER .....

5. Use ZOOM ON to find  $\lim_{x \rightarrow 0.5} (4x^2 - 1) \tan \pi x$  correct to 3 decimal places.

ANSWER .....

6. Determine the definite integral  $\int_0^{\pi/2} \frac{1}{2 + \cos x} dx$ .

ANSWER .....

7. If  $a_k = \tan \sqrt{k}$ , find the maximum  $|a_k|$  for  $k = 1$  to  $k = 200$ . (Note the absolute value sign.)

ANSWER .....

8. Evaluate  $\sum_{i=1}^{80} \frac{\sqrt{i}}{i+1} = \frac{\sqrt{1}}{1+1} + \frac{\sqrt{2}}{2+1} + \frac{\sqrt{3}}{3+1} + \dots + \frac{\sqrt{80}}{80+1}$ .

ANSWER .....

9. What is the first integer  $n$  such that

$$\sum_{i=1}^n \frac{\sqrt{i}}{i+1} = \frac{\sqrt{1}}{1+1} + \frac{\sqrt{2}}{2+1} + \frac{\sqrt{3}}{3+1} + \dots + \frac{\sqrt{n}}{n+1} > 20?$$

ANSWER .....

10. Use SIMPLE to find a simpler trigonometric expression for  $f(x) = \frac{\sin 2x}{1 + \cos 2x}$ .

ANSWER .....

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1. If  $x = 1.03$ , evaluate  $y = \frac{5 - \cos x}{x^2 \sqrt{4 + \tan x}}$ .

ANSWER .....

2. The **range** of the function  $f(x) = \frac{4x + \sqrt{x^2 + 5}}{x^2 + 2x + 3}$  is of the form  $[a, b]$ . Give  $a$  and  $b$  correct to two decimal places.

ANSWER .....

3. If  $f(x) = (x^{2.5} + 1)^{0.4}$ , find the second derivative and simplify.

ANSWER .....

4. At what point  $(x, y)$  does  $y = x^3$  intersect  $y = \cos 3x$ ? (Give  $x$  and  $y$  to 4 decimal places.)

ANSWER .....

5. Use ZOOM ON to find  $\lim_{x \rightarrow \pi/2} (1 + \cos x)^{\tan x}$  correct to 3 decimal places.

ANSWER .....

6. Determine the definite integral  $\int_{-1}^0 x \sqrt[3]{x+1} dx$ .

ANSWER .....

7. If  $a_k = k \cos k$ , find the maximum  $|a_k|$  for  $k = 1$  to  $k = 200$ . (Note the absolute value sign.)

ANSWER .....

8. Evaluate  $\sum_{i=1}^{80} \frac{1}{\sqrt{i+3}} = \frac{1}{\sqrt{1+3}} + \frac{1}{\sqrt{2+3}} + \frac{1}{\sqrt{3+3}} + \dots + \frac{1}{\sqrt{80+3}}$ .

ANSWER .....

9. What is the first integer  $n$  such that

$$\sum_{i=1}^n \frac{1}{\sqrt{i+3}} = \frac{1}{\sqrt{1+3}} + \frac{1}{\sqrt{2+3}} + \frac{1}{\sqrt{3+3}} + \dots + \frac{1}{\sqrt{n+3}} > 20?$$

ANSWER .....

10. Use SIMPLE to find a simpler trigonometric expression for  $f(x) = \cos^4 x - \sin^4 x$ .

ANSWER .....