First Name: ___________________________ Last Name: ___________________________
Student-No: ___________________________ Section: ___________________________

Grade:

The remainder of this page has been left blank for your workings.
Very short answer questions

1. 2 marks Each part is worth 1 marks. Please write your answers in the boxes.
Consider the function \( f(x) = \sqrt{(1-x)(1+x)} \).
(a) What is the domain of \( f(x) \)?

Answer:

(b) Find the interval(s) where \( f(x) \) is decreasing.

Answer:
Short answer questions — you must show your work

2. [4 marks] Each part is worth 2 marks.
   (a) Consider the function \( h(x) = -2\cos(x) - \sqrt{2}x \). At which point \( x \) in the open interval \((0, 2\pi)\) does \( h(x) \) have a local minimum?

   Answer:

   (b) Your friend tells you that the function \( f(x) = x^{11} + 2016x + 1 \) has two zeros. Explain why they are wrong.
Consider the function \( f(x) = \sqrt{x + 9} \).

(a) Find the 1st order Taylor polynomial \( T_1(x) \) of \( f(x) \) about \( x = 0 \).

(b) Use \( T_1(x) \) to approximate \( \sqrt{10} \).

(c) Find a bound for the absolute value of the error \( |R_1| \) in the approximation. Justify your answer.

(Note: You may leave your answers in calculator ready form.)
The remainder of this page has been left blank for your workings.
Very short answer questions

1. 2 marks Each part is worth 1 marks. Please write your answers in the boxes.
Consider the function \( f(x) = \sqrt{(x - 1)(x - 2)}. \)
(a) What is the domain of \( f(x) \)?

Answer:

(b) Find the interval(s) where \( f(x) \) is decreasing.

Answer:
Short answer questions — you must show your work

2. **4 marks** Each part is worth 2 marks.
   
   (a) Consider the function $h(x) = 2\sin(x) - x$. At which point $x$ in the open interval $(-\pi, \pi)$ does $h(x)$ have a **local** maximum?

   Answer:

   (b) Your friend tells you that the function $f(x) = x^5 + x + 1$ has two zeros. Explain why they are wrong.
Long answer question — you must show your work

3. 4 marks Consider the function $f(x) = \frac{1}{\sqrt{x}}$.

(a) Find the first order Taylor polynomial $T_1(x)$ of $f(x)$ about $x = 16$.

(b) Use $T_1(x)$ to approximate $\frac{1}{\sqrt{17}}$.

(c) Find a bound for the absolute value of the error $|R_1|$ in the approximation. Justify your answer.

(Note: You may leave your answers in calculator ready form.)
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Grade:

The remainder of this page has been left blank for your workings.
Very short answer questions

1. [2 marks] Each part is worth 1 marks. Please write your answers in the boxes.
Consider the function \( f(x) = \log((x - 2)(x - 4)) \). (Note: \( \log(x) = \ln(x) = \log_e(x) \))
(a) What is the domain of \( f(x) \)?
Answer:

(b) Find the interval(s) where \( f(x) \) is decreasing.
Answer:
Short answer questions — you must show your work

2. 4 marks Each part is worth 2 marks.

(a) Consider the function \( h(x) = x + 2 \cos(x) \). At which point \( x \) in the interval \((-\pi, \pi)\) does \( h(x) \) have a local maximum?

Answer:

(b) Your friend tells you that the function \( f(x) = -x^3 - x + 1 \) has two zeros. Explain why they are wrong.
Long answer question — you must show your work

3. 4 marks Consider the function \( f(x) = \frac{1}{\sqrt{x} + 1} \).

(a) Find the 1st order Taylor polynomial \( T_1(x) \) of \( f(x) \) about \( x = 8 \).

(b) Use \( T_1(x) \) to approximate \( \frac{1}{\sqrt{10}} \).

(c) Find a bound for the absolute value of the error \( |R_1| \) in the approximation. Justify your answer.

(Note: You may leave your answers in calculator ready form.)