Very short answer questions

1. 2 marks Each part is worth 1 marks. Please write your answers in the boxes.
Consider a function, \( h(x) \), whose third-degree Maclaurin polynomial is \( 1 - 3x + \frac{1}{6}x^2 + \frac{2}{7}x^3 \).
(a) What is \( h'(0) \)?

Answer:

(b) What is \( h''(0) \)?

Answer:

Short answer questions — you must show your work

2. 4 marks Each part is worth 2 marks.
(a) Estimate \( \sqrt{15} \) using a linear approximation

(b) Consider a function \( f(x) \) which has \( f^{(3)}(x) = \frac{x}{10 - \sin x} \). Show that when we approximate \( f(1) \) using its second degree Maclaurin polynomial, the absolute value of the error is less than \( \frac{1}{50} = 0.02 \).
Long answer question — you must show your work

3. [4 marks] Two particles move in the cartesian plane. Particle $A$ starts at $(3,0)$ while particle $B$ starts at $(0,0)$. Particle $A$ moves in the $+y$ direction at 1 unit per second, while $B$ moves in the $-y$ direction at 3 units per second. How fast is the distance between the particles changing when the distance between them is 5 units?
Very short answer questions

1. Each part is worth 1 marks. Please write your answers in the boxes.

Consider a function, \( h(x) \), whose third-degree Maclaurin polynomial is \( 5 - \frac{1}{3}x^2 + 2x^3 \).

(a) What is \( h'(0) \)?

Answer: 

(b) What is \( h''(0) \)?

Answer: 

Short answer questions — you must show your work

2. Each part is worth 2 marks.

(a) Estimate \( \sqrt{35} \) using a linear approximation

(b) Consider a function \( f(x) \) which has \( f^{(3)}(x) = \frac{x^3}{10 - x^2} \). Show that when we approximate \( f(1) \) using its second degree Maclaurin polynomial, the absolute value of the error is less than \( \frac{1}{50} = 0.02 \).
Long answer question — you must show your work

3. 4 marks Two particles move in the cartesian plane. Particle A travels on the $x$-axis starting at $(10, 0)$ and moving towards the origin with a speed of 2 units per second. Particle B travels on the $y$-axis starting at $(0, 12)$ and moving towards the origin with a speed of 3 units per second. What is the rate of change of the distance between the two particles when particle A reaches the point $(4, 0)$?
Very short answer questions

1. \[ \text{2 marks} \] Each part is worth 1 marks. Please write your answers in the boxes.

Consider a function, \( f(x) \), whose third-degree Maclaurin polynomial is \( 4 + 3x^2 + \frac{1}{2}x^3 \).

(a) What is \( f'(0) \)?

Answer:

(b) What is \( f''(0) \)?

Answer:

Short answer questions — you must show your work

2. \[ \text{4 marks} \] Each part is worth 2 marks.

(a) Estimate \( \sqrt{5} \) using a linear approximation

(b) Consider a function \( f(x) \) which has \( f^{(3)}(x) = \frac{1}{5}e^{-2x} \cdot \sin(x) \). Show that when we approximate \( f(1) \) using its second degree Maclaurin polynomial, the absolute value of the error is less than \( \frac{1}{30} \).
Long answer question — you must show your work

3. [4 marks] Two particles move in the Cartesian plane. Particle A starts at (2, 0) and moves on the $x$-axis away from the origin at 1 unit per second. Particle B starts at the origin, and moves along the $y$-axis at 2 units per second (in the $+y$-direction). How fast is the distance between the particles increasing when A reaches (6, 0)?
Very short answer questions

1. [2 marks] Each part is worth 1 mark. Please write your answers in the boxes.
   Consider a function, \( h(x) \), whose third-degree Maclaurin polynomial is \( 1 + 4x - \frac{1}{3}x^2 + \frac{3}{4}x^3 \).
   (a) What is \( h^{(3)}(0) \)?

   Answer:

   (b) What is \( h''(0) \)?

   Answer:

Short answer questions — you must show your work

2. [4 marks] Each part is worth 2 marks.
   (a) Estimate \( \sqrt[3]{26} \) using a linear approximation.

(b) Consider a function \( f(x) \) which has \( f^{(3)}(x) = \frac{e^{-x}}{8 + x^2} \). Show that when we approximate \( f(1) \) using its second degree Maclaurin polynomial, the absolute value of the error is less than 1/40.
Long answer question — you must show your work

Two particles move in the cartesian plane. Particle A travels on the x-axis starting at (10, 0) and moving towards the origin with a speed of 2 units per second. Particle B travels on the y-axis starting at (0, 2) and moving away from the origin with a speed of 4 units per second. What is the rate of change of the distance between the two particles when particle A reaches the point (5, 0)?