Chapter 4 TEST

**Part I – Calculator not permitted**

Show your work on multiple choices for partial marks.

1. If 

 (A) 3 (B) 1 (C) ­–1 (D) –3 (E) –5

2. The graph of $f\left(x\right)=x^{4}-6x^{3}-24x^{2}+37$ is concave down for

 (A)  (B) (C) $x<-1 or x>4$ (D) $x<-4 or x>1$ (E) $-1<x<4$

3. 

 (A)  (B)  (C) 

 (D)  (E) 



4. A bug begins to crawl up a vertical wire at time . The velocity *v* of the bug at time  *t*, , is given by the function whose graph is shown above.At what value of  *t* does the bug change direction?

 (A) 2 (B) 4 (C) 6 (D) 7 (E) 8

5. An equation of the line tangent to the graph of 

 (A) 

 (B) 

 (C) 

 (D) 

 (E) 

6. At what point on the graph of  is the tangent line parallel to the line  ?

 (A)  (B)  (C)  (D)  (E) 

 7. The graph of the derivative of *f* is shown in the figure above. Which of the following could be the graph of *f*?



8. The graph of the function *f* is shown in the figure above. Which of the following statements about  *f* is true?



 (A)  (B) 

 (C)  (D) 

 (E)  does not exist.

9. If , what is the value of 

 (A)  (B)  (C)  (D)  (E) 

10. What are all values of *x* for which the function *f* defined by  is increasing?

 (A) There are no such values of *x* . (B) 

 (C)  (D)  (E) All values of *x*

11. Let $f\left(x\right)=x^{3}-x^{2}-2x$. Does the Mean Value Theorem apply on the interval [-1, 1]?
If no, explain why. If yes, apply it and give the value of c.

12. a) Find the local linear approximation for $f\left(x\right)=x^{3}$ at 1.

b) Use it to approximate $1.1^{3}$.

 **Section II (calculator permitted)**

13. If 

 (A) 1 (B)  (C)  (D)  (E) 

14. The graph of the function  changes concavity at 

 (A) –1.58 (B) –1.63 (C) –1.67 (D) –1.89 (E) –2.33

15. Let *f* be a function such that 

 I. . II. .

 III. The derivative of  *f*  is continuous at .

 (A) I only (B) II only (C) I and II only (D) I and III only (E) II and III only

**Long Answers**

16. A television camera at ground level is filming the lift off of a rocket that is rising vertically according to the position equation $s=50t^{2}$, where *s* is measured in feet and *t* is measured in seconds. The camera is 2000 feet from the launch pad. Find the rate of change in the angle of elevation of the camera at 10 seconds after lift off.

17. Let $f\left(x\right)=ln\left(x^{2}+2x+3\right)$. Determine the domain, variations including the extrema points, the concavity and finally, sketch a rough graph (show the points of inflection on the graph). **[7]**

18. An open-top box is to be made by cutting congruent squares of side length *x* from the corners of a 20- by 25- inch sheet of tin and bending up the sides. How large should the squares be to make the box hold as much as possible? What is the resulting maximum volume? **[4]**