Solution

Math 241 Quiz 02

This quiz contains 07 questions. Answer at least 04 questions.

1. Suppose $x^2 + y^2 + z^2 = 9$, $\frac{dx}{dt} = 5$, and $\frac{dy}{dt} = 4$. Find $\frac{dz}{dt}$ when x = 2, y = 2 and z = 1. $(y^2 + y^2 + z^2)' = (q)'$ $2x \frac{dx}{dt} + 2y \frac{dy}{dt} + 2z \frac{dy}{dt} = 0$ $2z \frac{dx}{dt} = -2x \frac{dz}{dt} - 2y \frac{dy}{dt}$ $zu \frac{dz}{dt} = -2(z)(5) - 2(2)(4)$ $2\frac{dz}{dt} = -20 - 16$

2. Find the linearization of the function $f(x) = x^3 - x^2 + 3$ at a = -2.

$$f'(x) = 3x - 2x$$

$$f(a) = f(-2) = -8 - 4 + 3 = -9$$

$$-'(a) = f'(-2) = 3(-2)^2 - 2(-2)^{-1} + 2 + 16$$

$$f(x) = (6 \times + 23)$$

- 3. The height in meters of a projectile shot vertically upward from a point 2 m above ground level with an initial velocity of 24.5 m/s is $h=2+24.5t-4.9t^2$ after t seconds.
 - (a) Find the velocity after 2 s and 4 s.

$$h' = 24.5 - 9.8t$$
 $h'(2) = 24.5 - 9.8(2) = 4.9$
 $h'(4) = 24.5 - 9.8(4) = -14$

(b) When does the projectile reach its maximum height?

$$f'(t) = 0$$
 Dive max
 $24.5 - 9.8t = 0$
 $1 + 2.5 = 0$

(c) What is the maximum height?

$$h = 2 + 24.5(2.5) - 4.9(2.5)^{2}$$

$$= (32.675)^{2}$$

(d) When does it hit the ground?

$$h=0$$
 cause ground
 $2+24.5t-49.6^{2}=0$
USE quadratic formula
 $t=5.08$) because $t72.5$

(e) With what velocity does it hit the ground?

$$24.5 - 9.7(5.08) = -25.3$$

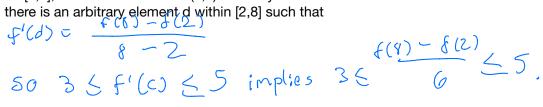
$$|-25.3 \text{ m/s}|$$

4. Find the absolute maximum of the function
$$f(x) = 5 + 54x - 2x^3$$
 in the interval $[0,4]$.

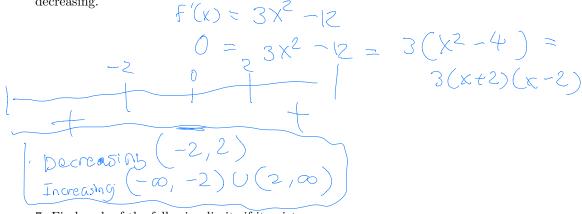
Find point $f'(x) = 5$
 $f'(x) = 54 - 6x^2$
 $f'(x) = 113$
 $f'(x) = 113$
 $f'(x) = 113$
 $f'(x) = 113$

5. Suppose f is differentiable everywhere and $3 \le f'(x) \le 5$ for all x. Show that $18 \le f(8) - f(2) \le 30$. Hint: Use Mean Value Theorem.

Because f(x) is differentiable everywhere its continuous everywhere. Therefore, it is continuous on [2,8], and differentiable on (2,8). Thus by MVT there is an arbitrary element d within [2,8] such that



6. Consider the function $f(x) = x^3 - 12x + 2$. Find the interval(s) in which the function is increasing. Also, find the interval(s) in which the function is decreasing.



7. Find each of the following limits if it exists.

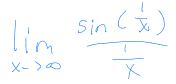
 $\lim_{x\to-\infty}\frac{x-2}{x^2+1}$ $\lim_{x\to-\infty}\frac{x}{x^2+1}$ When the exponent is greater the denomination is $\lim_{x\to\infty} = 0$

2.

$$\lim_{x\to\infty}x\sin(\frac{1}{x})$$

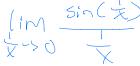
Assuming you do not know what L'Hopital Rules is.

The limit interval can be rewritten as:



We know that as x approaches infinity to 1/x we get 0.

So we can rewrite or manipulate the limit as:



For every 1/x replace that with z.

1 m str(z) 2->0 Z

Final Answer is 1.