

Calculators are not allowed

Answer the following questions:

7 points) Use differentials to find an approximate value of $\sqrt[3]{(2.9)^2 - 1}$

(7 points) Find an equation of the tangent line to the graph of

$$y + y^2 \sin x + \sin(xy) = 1$$

at $x = 0$.

(7 points) The length of each side of a cube increases at the rate of 0.6 cm/sec. How fast is the volume changing when the side of the cube is 10 cm long.

(7 points) Show that

$$|\cos^5 u - \cos^5 v| \leq \frac{5}{2} |u - v|$$

for any real numbers u and v .

Let

$$f(x) = x + \frac{4}{x^2}$$

- (3 points) Find the vertical and horizontal asymptotes for the graph of f (if any)
- (3 points) Find the intervals on which f is increasing or decreasing, and find the local extrema of f (if any).
- (3 points) Find the intervals on which the graph of f is concave upward or concave downward, and find the points of inflection (if any).
- (3 points) Sketch the graph of f .