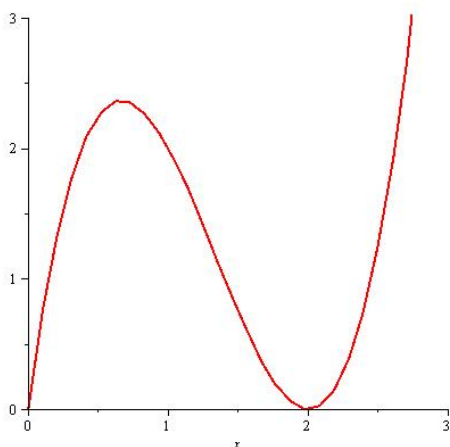


- Use an appropriate tangent line approximation to estimate $(8.1)^{\frac{1}{3}}$
- The length of a side of a cube is measured to be 10 cm with a possible error of $\pm .1$ cm. What is the maximum possible error if this measurement is used to determine the volume of the cube?
- Sketch the graph of a function $y = f(x)$ such that
 - $f(x) \geq 0$ for all x .
 - $f(0) = 0$.
 - $\lim_{x \rightarrow \infty} f(x) = 0$
 - $f'(x) < 0$ when $1 \leq x \leq 3$.
 - $f''(x) > 0$ when $2 < x < 4$
- The graph of $y = f(x)$ is given below.



(I.)

- When is $f'(x) > 0$?
 - When is $f''(x) < 0$?
 - What are the critical points of f ?
 - What are the inflection points of f ?
- Find the absolute maximum and minimum of $x^3 - 6x^2 + 9x + 3$ on the interval $[0, 4]$.
 - For each of the following functions find the critical numbers and determine whether each is a local max, a local min, or neither.
 - $3x^4 - 4x^3 + 7$
 - $x^{\frac{1}{3}}(x-1)^{\frac{2}{3}}$
 - Suppose that

$$f(x) = x^2 + ax + b$$
 for some constants a and b . If $x = 1$ is a critical number of f and $f(1) = 6$ what are a and b ?
 - Let $f(x) = x^3 - x^2 + x + 4$. Find the c which satisfies the mean value theorem applied to f on the interval $[1, 2]$.
 - Is there a differentiable function such that $f(0) = 0$, $f(1) = 7$, and $f'(x) \leq 5$? If so then find one, if not they explain why not.

10. Find the following infinite limits

(a) $\lim_{x \rightarrow \infty} \frac{2x}{\sqrt{3x^2 - 3}}$

(b) $\lim_{x \rightarrow \infty} \sqrt{4x^2 - 6} - x$

11. let $f(x) = \frac{x+1}{x-7}$

(a) What is the domain of f ?

(b) What are the vertical and horizontal asymptotes of f ?

(c) When is f increasing? decreasing?

(d) When is f concave up? concave down?

(e) Use the information from (a)-(d) to sketch the graph of f .

12. A farmer wants to enclose a rectangular area of 64 square feet along the shore of a river and then divide it into two pens with a fence down the middle perpendicular to the river. (There is no fence along the edge of the river). The fencing for the perimeter fence costs \$5 per foot. The fencing used to divide the pen costs \$10 per foot. What dimensions should the farmer make the pen to minimize the cost of the fence?

13. Find the most general anti-derivative of the following functions with respect to x

(a) $4 \sin(x) + 7$

(b) $x^5 - x^3 + 7x^2$.

(c) $\sec^2(x)$

14. The acceleration of a particle moving in a straight line with $t \geq 0$ is given by

$$a(t) = 2t - 4$$

(a) If the particle was at rest when $t = 0$, find $v(t)$.

(b) When was the particle moving to the left? To the right?

(c) When was the particle speeding up/slowing down?

(d) What is the total distance travelled by the particle from $t = 0$ to $t = 5$?

15. Estimate $\int_1^5 \frac{2}{1+x^2} dx$. Using $n = 4$ rectangles and left endpoints.