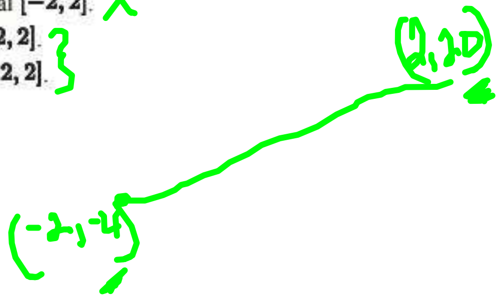
$(\frac{1}{2}, 2)$

1.

x	-2	-1	0	1	2
$g(x)$	-4	-1	4	11	20

The table above gives values of a function g at selected values of x. Which of the following statements, if true, would be individually sufficient to conclude that there exists a number c in the interval $[-2, 2]$ such that $g(c) = 6$?

1. g is defined for all x in the interval $[-2, 2]$.
2. g is increasing on the interval $[-2, 2]$.
3. g is continuous on the interval $[-2, 2]$.



(A) II only

(B) III only

(C) I and III only

(D) I, II, and III

2.

x	0	1	2	3	4	5
$f(x)$	1	−5	−4	2	−10	−15

Selected values of a continuous function f are given in the table above. What is the fewest possible number of zeros of f in the interval $[0, 5]$?

(A) Zero, because $f(x)$ is not equal to 0 for any of the values in the table.

(B) One, because f is continuous on the interval $[0, 5]$ and $f(0) > 0 > f(5)$.

(C) Two, because the values for $f(x)$ in the table change from positive to negative twice.

(D) Three, because f is continuous on the interval $[0, 5]$ and $f(0) > 0 > f(1)$, $f(1) < 0 < f(3)$, and $f(3) > 0 > f(5)$.

3. $f(x) = \dfrac{x^4+x^3+x^2+x+1}{380-\ln\left(\frac{x^2+1}{2}\right)}$

Let f be the function defined above. The Intermediate Value Theorem applied to f on the closed interval $[10, 12]$ guarantees a solution in $[10, 12]$ to which of the following equations?

(A) $f(x) = 0$

(B) $f(x) = 27.372$

(C) $f(x) = 42.421$

(D) $f(x) = 67.205$

f(x) is continuous

$f(10) = 29.6$

$c \longrightarrow f(12) = 60.3$

Unless otherwise specified, the domain of a function f is assumed to be the set of all real numbers x for which $f(x)$ is a real number.

piecewise

$$R(t) = \begin{cases} 41\sqrt{\frac{t}{20}} & \text{for } 0 \le t < 20 \\ \frac{100t^2+1000}{t^2+600} & \text{for } t \ge 20 \end{cases}$$

The total accumulated revenue a company has received up to time t is modeled by the function R defined above, where $R(t)$ is measured in millions of United States dollars and t is the time in years since 1980.

(a) Find $\lim_{t\to\infty} R(t)$. Explain the meaning of $\lim_{t\to\infty} R(t)$ in the context of the problem.

$$\lim_{t\to\infty} \frac{\boxed{100t^2}+1000}{\boxed{t^2}+600} \qquad \frac{100t^2}{t^2} = 100$$

As time increases, the revenue approaches \$100 million

Unless otherwise specified, the domain of a function f is assumed to be the set of all real numbers x for which $f(x)$ is a real number.

$$\lim_{x \to 20^-} 41\sqrt{\frac{20}{20}} \qquad 41\sqrt{1} = 41$$

$$R(t) = \begin{cases} 41\sqrt{\frac{t}{20}} & \text{for } 0 \le t < 20 \\ \frac{100t^2+1000}{t^2+600} & \text{for } t \ge 20 \end{cases}$$

$$\lim_{x \to 20^-} 41$$

The total accumulated revenue a company has received up to time t is modeled by the function R defined above, where $R(t)$ is measured in millions of United States dollars and t is the time in years since 1980.

Yes, it is — also defined at 20

(b) Is the function R continuous at $t = 20$? Justify your answer.

$$\lim_{x \to 20^+} \frac{100t^2+1000}{t^2+600} = \frac{100(t^2+10)}{t^2+600} = \frac{100((20^2)+10)}{20^2+600}$$

$$\frac{100(400+10)}{400+600} = \frac{41000}{1000} = 41$$

$$\lim_{x \to 20^+} 41$$

$$R(t) = \begin{cases} \boxed{41\sqrt{\frac{t}{20}}} & \text{for } 0 \le t < 20 \\ \frac{100t^3+1000}{t^2+600} & \text{for } t \ge 20 \end{cases}$$

[0,5] IVT

$-6 < 0 < 2.5$

The total accumulated revenue a company has received up to time t is modeled by the function R defined above, where $R(t)$ is measured in millions of United States dollars and t is the time in years since 1980.

(c) The company's total accumulated expenses up to time t is modeled by the function E defined by $E(t) = 3\log_2(12t+4)$, where $E(t)$ is measured in millions of United States dollars and t is the time in years since 1980. According to these models, is there a time t, for $0 \le t \le 5$, at which the total accumulated profit, $R(t) - E(t)$, is equal to 0 ? Justify your answer.

$R(0) - E(0)$

$41\sqrt{\frac{0}{20}} - 3\log_2(12(0)+4)$

$0 - 3\log_2(4)$

$R(0) - E(0)\ -6 < 0$

$R(5) - E(5)$

$41\sqrt{\frac{5}{20}} - 3\log_2(12(5)+4)$

$\frac{41}{2} - 3\log_2(64)$

$\frac{41}{2} - 18 = 2.5$