

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find the relative extrema of the function, if they exist.

1) $f(x) = x^2 - 8x + 18$

- A) Relative minimum at (4, 2)
- B) Relative maximum at (2, 4)
- C) Relative maximum at (4, 2)
- D) Relative minimum at (2, 4)

Answer: A

2) $f(x) = 2x^2 + 20x + 53$

- A) Relative minimum at (-5, 3)
- B) Relative maximum at (5, -3)
- C) Relative minimum at (-3, 5)
- D) Relative minimum at (3, -5)

Answer: A

3) $s(x) = -x^2 - 12x - 27$

- A) Relative maximum at (-12, -27)
- B) Relative maximum at (-6, 9)
- C) Relative maximum at (6, 9)
- D) Relative minimum at (12, -27)

Answer: B

4) $f(x) = -7x^2 - 2x - 2$

- A) Relative minimum at $\left(\frac{1}{7}, \frac{13}{7}\right)$
- B) Relative maximum at $\left(-\frac{1}{7}, -\frac{13}{7}\right)$
- C) Relative maximum at $\left(-7, -\frac{13}{7}\right)$
- D) Relative maximum at $\left(\frac{1}{7}, \frac{13}{7}\right)$

Answer: B

5) $f(x) = 0.4x^2 - 2.9x + 5.8$

- A) Relative minimum at (3.625, 0.54375)
- B) Relative maximum at (3.625, 0.54375)
- C) Relative minimum at (-3.625, 21.56875)
- D) Relative minimum at (3.625, 0)

Answer: A

6) $f(x) = x^3 - 3x^2 + 1$

- A) Relative maximum at (-2, -19); relative maximum at (0, 1)
- B) Relative maximum at (0, 1); relative minimum at (2, -3)
- C) Relative maximum at (2, -3)
- D) Relative minimum at (0, 1); relative maximum at (2, -3)

Answer: B

7) $y = x^3 - 3x^2 + 7x - 10$

- A) Relative maximum at (2, 6)
- B) Relative minimum at (1, 6)
- C) Relative maximum at (-1, 6)
- D) No relative extrema exist

Answer: D

8) $f(x) = x^3 - 12x + 4$

- A) Relative maximum at (5, 69); relative minimum at (-3, 13)
- B) Relative maximum at (5, 69); relative minimum at (2, -12)
- C) Relative minimum at (-2, 20); relative maximum at (2, -12)
- D) Relative maximum at (-2, 20); relative minimum at (2, -12)

Answer: D

9) $f(x) = -4x^3 + 4$

- A) Relative maximum at (0, -4)
- B) Relative maximum at (0, 4)
- C) Relative minimum at (0, 4)
- D) No relative extrema exist

Answer: D

10) $f(x) = \frac{2}{3}x^3 + \frac{1}{2}x^2 - 21x + 2$

- A) Relative maximum at $\left(-\frac{7}{2}, \frac{1273}{24}\right)$; relative minimum at $\left(\frac{7}{2}, -\frac{883}{24}\right)$
- B) Relative maximum at $\left(3, -\frac{77}{2}\right)$
- C) Relative maximum at $\left(-\frac{7}{2}, \frac{1273}{24}\right)$; relative minimum at $\left(3, -\frac{77}{2}\right)$
- D) Relative maximum at $\left(-3, \frac{103}{2}\right)$; relative minimum at $\left(\frac{7}{2}, -\frac{883}{24}\right)$

Answer: C

11) $f(x) = 3x^4 + 16x^3 + 24x^2 + 32$

- A) Relative minimum at (-2, 48), relative maximum at (0, 32)
- B) Relative minimum at (0, 32)
- C) Relative maximum at (-2, 48), relative minimum at (0, 32)
- D) Relative minimum at (-2, 48)

Answer: B

12) $f(x) = x^4 - 8x^2 + 6$

- A) Relative maximum at (2, -10); relative minimum at (-2, -10)
- B) Relative minimum at (0, 6); relative maxima at (2, -10), (-2, -22)
- C) Relative maximum at (0, 6); relative minimum at (2, -10)
- D) Relative maximum at (0, 6); relative minima at (2, -10), (-2, -10)

Answer: D

13) $f(x) = x^3 - 5x^4$

A) Relative maximum at (0,0); relative minima at $\left(-\frac{3}{20}, -\frac{27}{6400}\right)$ and $\left(\frac{3}{20}, \frac{27}{32000}\right)$

B) Relative maximum at $\left(\frac{3}{20}, \frac{27}{32000}\right)$

C) Relative maximum at $\left(\frac{3}{20}, \frac{27}{32000}\right)$; relative minimum at (0, 0)

D) Relative minimum at $\left(-\frac{3}{20}, -\frac{27}{6400}\right)$; relative maximum at (0, 0)

Answer: B

14) $f(x) = \frac{x^2 + 1}{x^2}$

A) No relative extrema exist

B) Relative maximum at (-1, 2); relative minimum at (1, 2)

C) Relative maximum at (0, 1)

D) Relative minimum at (0, 1)

Answer: A

15) $f(x) = \frac{4}{x^2 - 1}$

A) No relative extrema exist

B) Relative minimum at (0, -4)

C) Relative maximum at (0, 4)

D) Relative maximum at (0, -4)

Answer: D

16) $f(x) = \frac{-6}{x^2 + 1}$

A) Relative maximum at (0, -6)

B) Relative minimum at (0, -6)

C) Relative maximum at (0, 6)

D) No relative extrema exist

Answer: B

17) $f(x) = \frac{6x}{x^2 + 1}$

A) Relative minimum at (-1, -3); relative maximum at (1, 3)

B) Relative maximum at (0, 0)

C) Relative minimum at (-1, -3); relative maximum at (0, 0)

D) Relative maximum at (-1, -3); relative minimum at (1, 3)

Answer: A

$$18) f(x) = \frac{x+1}{x^2+3x+3}$$

- A) Relative maximum at $\left(0, \frac{1}{3}\right)$; relative minimum at $(-2, -1)$
- B) Relative minimum at $\left(0, \frac{1}{3}\right)$; relative maximum at $\left(-2, \frac{1}{3}\right)$
- C) No relative extrema exist
- D) Relative maximum at $(0, 3)$; relative minimum at $\left(-2, \frac{1}{3}\right)$

Answer: A

$$19) f(x) = x^{2/5} - 1$$

- A) Relative minimum at $(0, -1)$; relative maximum at $(1, 0)$
- B) No relative extrema exist
- C) Relative maximum at $(0, -1)$
- D) Relative minimum at $(0, -1)$

Answer: D

$$20) f(x) = (x+5)^{1/3}$$

- A) Relative minimum at $(5, 0)$
- B) Relative minimum at $(-5, 0)$
- C) No relative extrema exist
- D) Relative maximum at $(-5, 0)$

Answer: C

$$21) f(x) = \sqrt[3]{x+1}$$

- A) Relative minimum at $(1, 0)$
- B) Relative minimum at $(-1, 0)$
- C) Relative maximum at $(-1, 0)$
- D) No relative extrema exist

Answer: D

$$22) f(x) = (x+2)^{2/3} + 6$$

- A) Relative minimum at $(2, 6)$
- B) Relative minimum at $(-2, 6)$
- C) No relative extrema exist
- D) Relative maximum at $(-2, 6)$

Answer: B

$$23) f(x) = \frac{8}{\sqrt{1-6x^2}}$$

- A) Relative maximum at $(0, 8)$
- B) Relative minimum at $(2, 8)$
- C) Relative minimum at $(0, 8)$
- D) No relative extrema exist

Answer: C