Calculus Practice: Use Derivatives to Analyze Functions 10a

For each problem, find all points of relative minima and maxima.

1) $y = x^3 - 4x^2 + 5$

A) Relative minimum: $\left(\frac{8}{3}, -\frac{121}{27}\right)$
Relative maximum: $(0, 5)$

B) Relative minimum: $\left(\frac{8}{9}, \frac{1853}{729}\right)$
Relative maximum: $\left(\frac{1}{3}, \frac{124}{27}\right)$

C) No relative minima.
No relative maxima.

D) Relative minimum: $(4, 5)$
Relative maximum: $\left(\frac{32}{3}, \frac{20615}{27}\right)$

2) $y = x^4 - 3x^2 + 2$

A) Relative minima: $\left(-\frac{\sqrt{6}}{2}, -\frac{1}{4}\right), \left(\frac{\sqrt{6}}{2}, -\frac{1}{4}\right)$
Relative maximum: $(0, 2)$

B) No relative minima.
No relative maxima.

C) Relative minima: $(-2\sqrt{6}, 506), (4, 210), (2\sqrt{6}, 506)$
No relative maxima.

D) Relative minimum: $\left(\frac{\sqrt{6}}{6}, \frac{55}{36}\right)$
Relative maxima: $\left(-\frac{\sqrt{6}}{6}, \frac{55}{36}\right), \left(\frac{1}{3}, \frac{136}{81}\right)$

3) $y = -x^3 + 4x^2 - 3$

A) Relative minimum: $\left(\frac{8}{9}, -\frac{395}{729}\right)$
Relative maximum: $\left(\frac{1}{3}, -\frac{70}{27}\right)$

B) No relative minima.
Relative maxima: $(4, -3), \left(\frac{32}{3}, -\frac{20561}{27}\right)$

C) No relative minima.
No relative maxima.

D) Relative minimum: $(0, -3)$
Relative maximum: $\left(\frac{8}{3}, \frac{175}{27}\right)$

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

A) No relative minima.
No relative maxima.

B) Relative minimum: $\left(-12, \frac{71}{2}\right)$
No relative maxima.

C) Relative minimum: $(-3, -5)$
No relative maxima.

D) Relative minimum: $(-1, -3)$
No relative maxima.

5) $y = -\frac{x^2}{2} - 3x - \frac{11}{2}$

A) No relative minima.
Relative maximum: $(-1, -3)$

B) No relative minima.
Relative maximum: $(-3, -1)$

C) No relative minima.
Relative maximum: $\left(-12, -\frac{83}{2}\right)$

D) No relative minima.
No relative maxima.

6) $f(x) = \frac{x^2}{2} + 4x + 8$

A) No relative minima.
Relative maximum: $\left(-\frac{4}{3}, \frac{32}{9}\right)$

B) Relative minimum: $(-4, 0)$
No relative maxima.

C) No relative minima.
No relative maxima.

D) No relative minima.
Relative maximum: $(-16, 72)$

7) $y = -x^3 + x^2 + 4$

A) Relative minima: $\left(\frac{1}{3}, \frac{110}{27}\right), \left(\frac{2}{9}, \frac{2944}{729}\right)$
No relative maxima.

B) No relative minima.
No relative maxima.

C) Relative minima: $(4, -44), \left(\frac{8}{3}, -\frac{212}{27}\right)$
No relative maxima.

D) Relative minimum: $(0, 4)$
Relative maximum: $\left(\frac{2}{3}, \frac{112}{27}\right)$

8) $y = x^3 + \frac{9x^2}{2} + 12x + 6$

A) No relative minima.
Relative maximum: $(2, 56)$

B) No relative minima.
Relative maximum: $(4, 190)$

C) No relative minima.
No relative maxima.

D) No relative minima.
Relative maximum: $\left(3, \frac{219}{2}\right)$

9) $y = x^4 - 4x^2 + 1$

A) Relative minimum: $(-4\sqrt{2}, 897)$
Relative maxima: $(4, 193), (4\sqrt{2}, 897)$

B) Relative minima: $(-\sqrt{2}, -3), (\sqrt{2}, -3)$
Relative maximum: $(0, 1)$

C) Relative minima: $\left(\frac{1}{3}, \frac{46}{81}\right), \left(\frac{\sqrt{2}}{3}, \frac{13}{81}\right)$
Relative maximum: $\left(-\frac{\sqrt{2}}{3}, \frac{13}{81}\right)$

D) No relative minima.
No relative maxima.

10) $y = x^3 - 10x^2 + 33x - 38$

A) Relative minima: $(12, 646), \left(\frac{44}{3}, \frac{39146}{27}\right)$
No relative maxima.

B) Relative minima: $(1, -14), \left(\frac{11}{9}, -\frac{7858}{729}\right)$
No relative maxima.

C) Relative minimum: $\left(\frac{11}{3}, -\frac{58}{27}\right)$
Relative maximum: $(3, -2)$

D) No relative minima.
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