Calculus Practice: Use Derivatives to Analyze Functions 11b

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

1) $f(x) = -\frac{1}{5}(x+3)^{\frac{5}{3}} + 2(x+3)^{\frac{2}{3}} + 1$

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

3) $y = \frac{3}{16}(x-1)^{\frac{4}{3}} + \frac{3}{2}(x-1)^{\frac{1}{3}} - 1$

4) $y = \frac{1}{x^2 - 4}$

5) $y = \frac{1}{6}(x-1)^{\frac{7}{3}} - \frac{14}{3}(x-1)^{\frac{1}{3}}$

6) $y = \frac{1}{6}(x+2)^{\frac{7}{3}} - \frac{14}{3}(x+2)^{\frac{1}{3}}$

7) $f(x) = \frac{3}{x+4}$

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

9) $f(x) = -\cos(x)$; $[-\pi, \pi]$

10) $y = 2\cos(x)$; $[-\pi, \pi]$

11) $y = -2\csc(2x)$; $[-\pi, \pi]$

12) $y = -\cot(x)$; $[-\pi, \pi]$

13) $y = \csc(2x)$; $[-\pi, \pi]$

14) $f(x) = -\sin(2x)$; $[-\pi, \pi]$

15) $f(x) = 2\sin(2x)$; $[-\pi, \pi]$

16) $f(x) = \sin(2x)$; $[-\pi, \pi]$

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

1) $f(x) = -\frac{1}{5}(x+3)^{\frac{5}{3}} + 2(x+3)^{\frac{2}{3}} + 1$

Relative minimum: $(-3, 1)$

Relative maximum: $\left(1, \frac{5 + 12\sqrt[3]{2}}{5}\right)$

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

Relative minimum: $(0, 0)$

Relative maximum: $(-4, -4)$

3) $y = \frac{3}{16}(x-1)^{\frac{4}{3}} + \frac{3}{2}(x-1)^{\frac{1}{3}} - 1$

Relative minimum: $\left(-1, \frac{-8 - 9\sqrt[3]{2}}{8}\right)$

No relative maxima.

4) $y = \frac{1}{x^2 - 4}$

No relative minima.

Relative maximum: $\left(0, -\frac{1}{4}\right)$

5) $y = \frac{1}{6}(x-1)^{\frac{7}{3}} - \frac{14}{3}(x-1)^{\frac{1}{3}}$

Relative minimum: $(3, -4\sqrt[3]{2})$

Relative maximum: $(-1, 4\sqrt[3]{2})$

6) $y = \frac{1}{6}(x+2)^{\frac{7}{3}} - \frac{14}{3}(x+2)^{\frac{1}{3}}$

Relative minimum: $(0, -4\sqrt[3]{2})$

Relative maximum: $(-4, 4\sqrt[3]{2})$

7) $f(x) = \frac{3}{x+4}$

No relative minima.

No relative maxima.

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

Relative minimum: $(0, 3)$
No relative maxima.

9) $f(x) = -\cos(x)$; $[-\pi, \pi]$

Relative minimum: $(0, -1)$
Relative maxima: $(-\pi, 1)$, $(\pi, 1)$

10) $y = 2\cos(x)$; $[-\pi, \pi]$

Relative minima: $(-\pi, -2)$, $(\pi, -2)$
Relative maximum: $(0, 2)$

11) $y = -2\csc(2x)$; $[-\pi, \pi]$

Relative minima: $\left(-\frac{\pi}{4}, 2\right)$, $\left(\frac{3\pi}{4}, 2\right)$

Relative maxima: $\left(-\frac{3\pi}{4}, -2\right)$, $\left(\frac{\pi}{4}, -2\right)$

12) $y = -\cot(x)$; $[-\pi, \pi]$

No relative minima.
No relative maxima.

13) $y = \csc(2x)$; $[-\pi, \pi]$

Relative minima: $\left(-\frac{3\pi}{4}, 1\right)$, $\left(\frac{\pi}{4}, 1\right)$

Relative maxima: $\left(-\frac{\pi}{4}, -1\right)$, $\left(\frac{3\pi}{4}, -1\right)$

14) $f(x) = -\sin(2x)$; $[-\pi, \pi]$

Relative minima: $\left(-\frac{3\pi}{4}, -1\right)$, $\left(\frac{\pi}{4}, -1\right)$

Relative maxima: $\left(-\frac{\pi}{4}, 1\right)$, $\left(\frac{3\pi}{4}, 1\right)$

15) $f(x) = 2\sin(2x)$; $[-\pi, \pi]$

Relative minima: $\left(-\frac{\pi}{4}, -2\right)$, $\left(\frac{3\pi}{4}, -2\right)$

Relative maxima: $\left(-\frac{3\pi}{4}, 2\right)$, $\left(\frac{\pi}{4}, 2\right)$

16) $f(x) = \sin(2x)$; $[-\pi, \pi]$

Relative minima: $\left(-\frac{\pi}{4}, -1\right)$, $\left(\frac{3\pi}{4}, -1\right)$

Relative maxima: $\left(-\frac{3\pi}{4}, 1\right)$, $\left(\frac{\pi}{4}, 1\right)$