

## Finding Increasing and Decreasing Intervals

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**For each problem, find the open intervals where the function is increasing and decreasing.**

1)  $y = -\frac{1}{5}(x+4)^{\frac{5}{3}} + 2(x+4)^{\frac{2}{3}} - 1$

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

3)  $y = -\frac{3x}{x+2}$

4)  $y = -x^2$

5)  $f(x) = \csc(x); [-\pi, \pi]$

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

7)  $f(x) = -x^5 + 3x^3$

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

9)  $y = -x^5 + 3x^3 + 1$

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

11)  $y = -x^5 + 2x^3 + 3$

12)  $f(x) = -(3x-9)^{\frac{1}{3}}$

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

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

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

16)  $y = (3x+12)^{\frac{1}{2}}$

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

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

19)  $y = x^3 + 5x^2 + 3x - 7$

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

## Answers to Finding Increasing and Decreasing Intervals

- 1) Increasing:  $(-4, 0)$  Decreasing:  $(-\infty, -4), (0, \infty)$
- 2) Increasing:  $(-\infty, 1), (1, \infty)$  Decreasing: No intervals exist.
- 3) Increasing: No intervals exist. Decreasing:  $(-\infty, -2), (-2, \infty)$
- 4) Increasing:  $(-\infty, 0)$  Decreasing:  $(0, \infty)$
- 5) Increasing:  $(-\pi, -\frac{\pi}{2}), (\frac{\pi}{2}, \pi)$  Decreasing:  $(-\frac{\pi}{2}, 0), (0, \frac{\pi}{2})$
- 6) Increasing:  $(1, \infty)$  Decreasing:  $(-\infty, 1)$
- 7) Increasing:  $(-\frac{3\sqrt{5}}{5}, \frac{3\sqrt{5}}{5})$  Decreasing:  $(-\infty, -\frac{3\sqrt{5}}{5}), (\frac{3\sqrt{5}}{5}, \infty)$
- 8) Increasing: No intervals exist. Decreasing:  $(-1, \infty)$
- 9) Increasing:  $(-\frac{3\sqrt{5}}{5}, \frac{3\sqrt{5}}{5})$  Decreasing:  $(-\infty, -\frac{3\sqrt{5}}{5}), (\frac{3\sqrt{5}}{5}, \infty)$
- 10) Increasing:  $(-1 - \sqrt{2}, -1), (-1 + \sqrt{2}, \infty)$  Decreasing:  $(-\infty, -1 - \sqrt{2}), (-1, -1 + \sqrt{2})$
- 11) Increasing:  $(-\frac{\sqrt{30}}{5}, \frac{\sqrt{30}}{5})$  Decreasing:  $(-\infty, -\frac{\sqrt{30}}{5}), (\frac{\sqrt{30}}{5}, \infty)$
- 12) Increasing: No intervals exist. Decreasing:  $(-\infty, \infty)$  13) Increasing:  $(-2, \infty)$  Decreasing:  $(-\infty, -2)$
- 14) Increasing:  $(0, 4)$  Decreasing:  $(-\infty, 0), (4, \infty)$
- 15) Increasing:  $(-\frac{3\pi}{4}, -\frac{\pi}{2}), (-\frac{\pi}{2}, -\frac{\pi}{4}), (\frac{\pi}{4}, \frac{\pi}{2}), (\frac{\pi}{2}, \frac{3\pi}{4})$  Decreasing:  $(-\pi, -\frac{3\pi}{4}), (-\frac{\pi}{4}, 0), (0, \frac{\pi}{4}), (\frac{3\pi}{4}, \pi)$
- 16) Increasing:  $(-4, \infty)$  Decreasing: No intervals exist. 17) Increasing:  $(-\infty, -1), (3, \infty)$  Decreasing:  $(-1, 3)$
- 18) Increasing:  $(-\sqrt{2}, 0), (\sqrt{2}, \infty)$  Decreasing:  $(-\infty, -\sqrt{2}), (0, \sqrt{2})$
- 19) Increasing:  $(-\infty, -3), (-\frac{1}{3}, \infty)$  Decreasing:  $(-3, -\frac{1}{3})$
- 20) Increasing:  $(-\infty, -2)$  Decreasing:  $(-2, \infty)$