Calculus Practice: Use Derivatives to Analyze Functions 4a

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

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

A) Increasing: $\left(-\infty, \frac{1}{3}\right)$ Decreasing: $\left(\frac{1}{3}, \infty\right)$

B) Increasing: $(1, \infty)$ Decreasing: $(-\infty, 1)$

C) Increasing: $(4, \infty)$ Decreasing: $(-\infty, 4)$

D) Increasing: $(-\infty, 1)$ Decreasing: $(1, \infty)$

2) $f(x) = x^2 + 6x + 5$

A) Increasing: $(-\infty, -1)$ Decreasing: $(-1, \infty)$

B) Increasing: $(-3, \infty)$ Decreasing: $(-\infty, -3)$

C) Increasing: $(-\infty, -3)$ Decreasing: $(-3, \infty)$

D) Increasing: $(-12, \infty)$ Decreasing: $(-\infty, -12)$

3) $y = -x^3 - 10x^2 - 32x - 32$

A) Increasing: $\left(-16, -\frac{32}{3}\right)$ Decreasing: $(-\infty, -16), \left(-\frac{32}{3}, \infty\right)$

B) Increasing: $\left(-4, -\frac{8}{3}\right)$ Decreasing: $(-\infty, -4), \left(-\frac{8}{3}, \infty\right)$

C) Increasing: $(-\infty, -4), \left(-\frac{8}{3}, \infty\right)$ Decreasing: $\left(-4, -\frac{8}{3}\right)$

D) Increasing: $\left(-\infty, -\frac{4}{3}\right), \left(-\frac{8}{9}, \infty\right)$ Decreasing: $\left(-\frac{4}{3}, -\frac{8}{9}\right)$

4) $f(x) = x^3 + 8x^2 + 21x + 14$

A) Increasing: $\left(-1, -\frac{7}{9}\right)$ Decreasing: $(-\infty, -1), \left(-\frac{7}{9}, \infty\right)$

B) Increasing: $(-\infty, -12), \left(-\frac{28}{3}, \infty\right)$ Decreasing: $\left(-12, -\frac{28}{3}\right)$

C) Increasing: $\left(-3, -\frac{7}{3}\right)$ Decreasing: $(-\infty, -3), \left(-\frac{7}{3}, \infty\right)$

D) Increasing: $(-\infty, -3), \left(-\frac{7}{3}, \infty\right)$ Decreasing: $\left(-3, -\frac{7}{3}\right)$

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

A) Increasing: $\left(\frac{-3-\sqrt{17}}{4}, 0\right), \left(\frac{-3+\sqrt{17}}{4}, \infty\right)$ Decreasing: $\left(-\infty, \frac{-3-\sqrt{17}}{4}\right), \left(0, \frac{-3+\sqrt{17}}{4}\right)$

B) Increasing: $\left(-\infty, \frac{-3-\sqrt{17}}{4}\right), \left(0, \frac{-3+\sqrt{17}}{4}\right)$ Decreasing: $\left(\frac{-3-\sqrt{17}}{4}, 0\right), \left(\frac{-3+\sqrt{17}}{4}, \infty\right)$

C) Increasing: $\left(-\infty, \frac{-3-\sqrt{17}}{12}\right), \left(\frac{1}{3}, \frac{-3+\sqrt{17}}{12}\right)$ Decreasing: $\left(\frac{-3-\sqrt{17}}{12}, \frac{1}{3}\right), \left(\frac{-3+\sqrt{17}}{12}, \infty\right)$

D) Increasing: $(-3-\sqrt{17}, 4), (-3+\sqrt{17}, \infty)$ Decreasing: $(-\infty, -3-\sqrt{17}), (4, -3+\sqrt{17})$

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

A) Increasing: $(-\infty, -1), (0, 1)$ Decreasing: $(-1, 0), (1, \infty)$

B) Increasing: $\left(-\frac{1}{3}, \frac{1}{3}\right), \left(\frac{1}{3}, \infty\right)$ Decreasing: $\left(-\infty, -\frac{1}{3}\right), \left(\frac{1}{3}, \frac{1}{3}\right)$

C) Increasing: $(-\infty, -4), (4, 4)$ Decreasing: $(-4, 4), (4, \infty)$

D) Increasing: $(-1, 0), (1, \infty)$ Decreasing: $(-\infty, -1), (0, 1)$

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

A) Increasing: $\left(-\infty, -\frac{12\sqrt{5}}{5}\right), \left(\frac{12\sqrt{5}}{5}, \infty\right)$ Decreasing: $\left(-\frac{12\sqrt{5}}{5}, \frac{12\sqrt{5}}{5}\right)$

B) Increasing: $\left(-\infty, -\frac{3\sqrt{5}}{5}\right), \left(\frac{3\sqrt{5}}{5}, \infty\right)$ Decreasing: $\left(-\frac{3\sqrt{5}}{5}, \frac{3\sqrt{5}}{5}\right)$

C) Increasing: $\left(-\frac{3\sqrt{5}}{5}, \frac{3\sqrt{5}}{5}\right)$ Decreasing: $\left(-\infty, -\frac{3\sqrt{5}}{5}\right), \left(\frac{3\sqrt{5}}{5}, \infty\right)$

D) Increasing: $\left(-\frac{\sqrt{5}}{5}, \frac{\sqrt{5}}{5}\right)$ Decreasing: $\left(-\infty, -\frac{\sqrt{5}}{5}\right), \left(\frac{\sqrt{5}}{5}, \infty\right)$

8) $f(x) = x^5 - 3x^3 + 1$

A) Increasing: $\left(-\frac{\sqrt{5}}{5}, \frac{\sqrt{5}}{5}\right)$ Decreasing: $\left(-\infty, -\frac{\sqrt{5}}{5}\right), \left(\frac{\sqrt{5}}{5}, \infty\right)$

B) Increasing: $\left(-\infty, -\frac{3\sqrt{5}}{5}\right), \left(\frac{3\sqrt{5}}{5}, \infty\right)$ Decreasing: $\left(-\frac{3\sqrt{5}}{5}, \frac{3\sqrt{5}}{5}\right)$

C) Increasing: $\left(-\frac{3\sqrt{5}}{5}, \frac{3\sqrt{5}}{5}\right)$ Decreasing: $\left(-\infty, -\frac{3\sqrt{5}}{5}\right), \left(\frac{3\sqrt{5}}{5}, \infty\right)$

D) Increasing: $\left(-\infty, -\frac{12\sqrt{5}}{5}\right), \left(\frac{12\sqrt{5}}{5}, \infty\right)$ Decreasing: $\left(-\frac{12\sqrt{5}}{5}, \frac{12\sqrt{5}}{5}\right)$

Calculus Practice: Use Derivatives to Analyze Functions 4a

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

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

A) Increasing: $\left(-\infty, \frac{1}{3}\right)$ Decreasing: $\left(\frac{1}{3}, \infty\right)$

*B) Increasing: $(1, \infty)$ Decreasing: $(-\infty, 1)$

C) Increasing: $(4, \infty)$ Decreasing: $(-\infty, 4)$

D) Increasing: $(-\infty, 1)$ Decreasing: $(1, \infty)$

2) $f(x) = x^2 + 6x + 5$

A) Increasing: $(-\infty, -1)$ Decreasing: $(-1, \infty)$

*B) Increasing: $(-3, \infty)$ Decreasing: $(-\infty, -3)$

C) Increasing: $(-\infty, -3)$ Decreasing: $(-3, \infty)$

D) Increasing: $(-12, \infty)$ Decreasing: $(-\infty, -12)$

3) $y = -x^3 - 10x^2 - 32x - 32$

A) Increasing: $\left(-16, -\frac{32}{3}\right)$ Decreasing: $(-\infty, -16), \left(-\frac{32}{3}, \infty\right)$

*B) Increasing: $\left(-4, -\frac{8}{3}\right)$ Decreasing: $(-\infty, -4), \left(-\frac{8}{3}, \infty\right)$

C) Increasing: $(-\infty, -4), \left(-\frac{8}{3}, \infty\right)$ Decreasing: $\left(-4, -\frac{8}{3}\right)$

D) Increasing: $\left(-\infty, -\frac{4}{3}\right), \left(-\frac{8}{9}, \infty\right)$ Decreasing: $\left(-\frac{4}{3}, -\frac{8}{9}\right)$

4) $f(x) = x^3 + 8x^2 + 21x + 14$

A) Increasing: $\left(-1, -\frac{7}{9}\right)$ Decreasing: $(-\infty, -1), \left(-\frac{7}{9}, \infty\right)$

B) Increasing: $(-\infty, -12), \left(-\frac{28}{3}, \infty\right)$ Decreasing: $\left(-12, -\frac{28}{3}\right)$

C) Increasing: $\left(-3, -\frac{7}{3}\right)$ Decreasing: $(-\infty, -3), \left(-\frac{7}{3}, \infty\right)$

*D) Increasing: $(-\infty, -3), \left(-\frac{7}{3}, \infty\right)$ Decreasing: $\left(-3, -\frac{7}{3}\right)$

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

*A) Increasing: $\left(\frac{-3-\sqrt{17}}{4}, 0\right), \left(\frac{-3+\sqrt{17}}{4}, \infty\right)$ Decreasing: $\left(-\infty, \frac{-3-\sqrt{17}}{4}\right), \left(0, \frac{-3+\sqrt{17}}{4}\right)$

B) Increasing: $\left(-\infty, \frac{-3-\sqrt{17}}{4}\right), \left(0, \frac{-3+\sqrt{17}}{4}\right)$ Decreasing: $\left(\frac{-3-\sqrt{17}}{4}, 0\right), \left(\frac{-3+\sqrt{17}}{4}, \infty\right)$

C) Increasing: $\left(-\infty, \frac{-3-\sqrt{17}}{12}\right), \left(\frac{1}{3}, \frac{-3+\sqrt{17}}{12}\right)$ Decreasing: $\left(\frac{-3-\sqrt{17}}{12}, \frac{1}{3}\right), \left(\frac{-3+\sqrt{17}}{12}, \infty\right)$

D) Increasing: $(-3-\sqrt{17}, 4), (-3+\sqrt{17}, \infty)$ Decreasing: $(-\infty, -3-\sqrt{17}), (4, -3+\sqrt{17})$

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

*A) Increasing: $(-\infty, -1), (0, 1)$ Decreasing: $(-1, 0), (1, \infty)$

B) Increasing: $\left(-\frac{1}{3}, \frac{1}{3}\right), \left(\frac{1}{3}, \infty\right)$ Decreasing: $\left(-\infty, -\frac{1}{3}\right), \left(\frac{1}{3}, \frac{1}{3}\right)$

C) Increasing: $(-\infty, -4), (4, 4)$ Decreasing: $(-4, 4), (4, \infty)$

D) Increasing: $(-1, 0), (1, \infty)$ Decreasing: $(-\infty, -1), (0, 1)$

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

A) Increasing: $\left(-\infty, -\frac{12\sqrt{5}}{5}\right), \left(\frac{12\sqrt{5}}{5}, \infty\right)$ Decreasing: $\left(-\frac{12\sqrt{5}}{5}, \frac{12\sqrt{5}}{5}\right)$

*B) Increasing: $\left(-\infty, -\frac{3\sqrt{5}}{5}\right), \left(\frac{3\sqrt{5}}{5}, \infty\right)$ Decreasing: $\left(-\frac{3\sqrt{5}}{5}, \frac{3\sqrt{5}}{5}\right)$

C) Increasing: $\left(-\frac{3\sqrt{5}}{5}, \frac{3\sqrt{5}}{5}\right)$ Decreasing: $\left(-\infty, -\frac{3\sqrt{5}}{5}\right), \left(\frac{3\sqrt{5}}{5}, \infty\right)$

D) Increasing: $\left(-\frac{\sqrt{5}}{5}, \frac{\sqrt{5}}{5}\right)$ Decreasing: $\left(-\infty, -\frac{\sqrt{5}}{5}\right), \left(\frac{\sqrt{5}}{5}, \infty\right)$

8) $f(x) = x^5 - 3x^3 + 1$

A) Increasing: $\left(-\frac{\sqrt{5}}{5}, \frac{\sqrt{5}}{5}\right)$ Decreasing: $\left(-\infty, -\frac{\sqrt{5}}{5}\right), \left(\frac{\sqrt{5}}{5}, \infty\right)$

*B) Increasing: $\left(-\infty, -\frac{3\sqrt{5}}{5}\right), \left(\frac{3\sqrt{5}}{5}, \infty\right)$ Decreasing: $\left(-\frac{3\sqrt{5}}{5}, \frac{3\sqrt{5}}{5}\right)$

C) Increasing: $\left(-\frac{3\sqrt{5}}{5}, \frac{3\sqrt{5}}{5}\right)$ Decreasing: $\left(-\infty, -\frac{3\sqrt{5}}{5}\right), \left(\frac{3\sqrt{5}}{5}, \infty\right)$

D) Increasing: $\left(-\infty, -\frac{12\sqrt{5}}{5}\right), \left(\frac{12\sqrt{5}}{5}, \infty\right)$ Decreasing: $\left(-\frac{12\sqrt{5}}{5}, \frac{12\sqrt{5}}{5}\right)$