

SATPREP

Assignment : *Second Derivative and Concavity Test*

Type -I

- Find and classify the critical point(s).
- Find the interval(s) where $f(x)$ is increasing.
- Find the interval(s) where $f(x)$ is decreasing.

1. $f(x) = x^2 - x - 1$	2. $f(x) = 2x^4 - 4x^2 + 1$	3. $f(x) = xe^{1/x}$
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Type -II

- Find the x -coordinate of the point(s) of inflection.
- Find the interval(s) where $f(x)$ is concave up.
- Find the interval(s) where $f(x)$ is concave down.

4. $f(x) = 4x^3 + 21x^2 + 36x - 20$	5. $f(x) = 2x^{1/5} + 3$	6. $f(x) = -x^4 + 4x^3 - 4x + 1$
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Find all points of inflection of the function. Justify your answer.

7. $y = xe^x$	8. $f(x) = \tan^{-1} x$
9. $f(x) = x^{1/3}(x - 4)$	10. $y = \frac{x^3 - 2x^2 + x - 1}{x - 2}$

Answers:

	Relative Min f' changes from $-$ to $+$	Relative Max f' changes from $+$ to $-$	Increasing $f' > 0$	Decreasing $f' < 0$
1.	$\left(\frac{1}{2}, -\frac{5}{4}\right)$	None	$\left(\frac{1}{2}, \infty\right)$	$\left(-\infty, \frac{1}{2}\right)$
2.	$(-1, -1)$ and $(1, -1)$	$(0, 1)$	$(-1, 0)$ and $(1, \infty)$	$(-\infty, -1)$ and $(0, 1)$
3.	$(1, e)$	None	$(-\infty, 0)$ and $(1, \infty)$	$(0, 1)$

	x-coordinate of point of inflection f'' changes signs	Concave Up $f'' > 0$	Concave Down $f'' < 0$
4.	$x = -\frac{7}{4}$	$\left(-\frac{7}{4}, \infty\right)$	$\left(-\infty, -\frac{7}{4}\right)$
5.	$x = 0$	$(-\infty, 0)$	$(0, \infty)$
6.	$x = 0$ and $x = 2$	$(0, 2)$	$(-\infty, 2)$ and $(2, \infty)$

7. $\left(-2, -\frac{2}{e^2}\right)$	8. $(0, 0)$	9. $(0, 0)$ and $(-2, 6\sqrt[3]{2})$	10. $(1, 1)$
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