

Quiz 7 Practice

For each function below, find the intervals on which f is increasing/decreasing and the local extrema.

(i) $f(x) = 5x^2 - 10x - 3$

$f'(x) = 10x - 10$

Partition #s of f' :

① $f'(x) = 0 \Rightarrow 10x - 10 = 0$
 $\Rightarrow \boxed{x = 1}$

② $f'(x)$ DNE \Rightarrow none

($x = 1$ is a critical #)

$$\begin{array}{c} - \quad + \quad f' \\ \hline 1 \end{array}$$

x	$f'(x)$
0	-10
2	10

f is decreasing on $(-\infty, 1)$
 f is ~~decreasing~~ increasing on $(1, \infty)$
 local min at $x = 1$

(ii) $f(x) = -3x^3 - 9x^2 + 72x + 20$

$f'(x) = -9x^2 - 18x + 72$

Partition #s of f' :

① $f'(x) = 0 \Rightarrow -9x^2 - 18x + 72 = 0$
 $\Rightarrow -9(x^2 + 2x - 8) = 0$
 $\Rightarrow -9(x+4)(x-2) = 0$
 $\Rightarrow \boxed{x = -4 \quad x = 2}$

② $f'(x)$ DNE \Rightarrow none

($x = -4$ and $x = 2$ are critical #s)

$$\begin{array}{c} - \quad + \quad - \quad f' \\ \hline -4 \quad 2 \end{array}$$

x	$f'(x)$
-5	-72 -63
0	72
3	72 -63

f is decreasing on $(-\infty, -4) \cup (2, \infty)$
 f is increasing on $(-4, 2)$
 local max: $x = 2$
 local min: $x = -4$

$$(iii) f(x) = x^4 + 4x^3 + 30$$

$$f'(x) = 4x^3 + 12x^2$$

Partition #s of f'

$$\begin{aligned} (1) f'(x) = 0 &\Rightarrow 4x^3 + 12x^2 = 0 \\ &\Rightarrow 4x^2(x+3) = 0 \\ &\Rightarrow \boxed{x=0, x=-3} \end{aligned}$$

$$(2) f'(x) \text{ DNE} \Rightarrow \text{none}$$

($x=0$ and $x=-3$ are critical #s)

- + + f'	
-3 0	
x	$f'(x)$
-4	-64
-1	8
1	16

f is decreasing on $(-\infty, -3)$
 f is increasing on $(-3, \infty)$
 local min at $x = -3$

$$(iv) f(x) = (x+3)e^x$$

$$\begin{aligned} f'(x) &= e^x + (x+3)e^x \\ &= e^x(x+4) \end{aligned}$$

Partition #s of f'

$$\begin{aligned} (1) f'(x) = 0 &\Rightarrow e^x(x+4) = 0 \\ &\Rightarrow \boxed{x = -4} \end{aligned}$$

$$(2) f'(x) \text{ DNE} \Rightarrow \text{none}$$

($x = -4$ is a critical #)

- + f'	
-4	
x	$f'(x)$
-5	$-e^{-5} \approx -.007$
0	4

f is decreasing on $(-\infty, -4)$
 f is increasing on $(-4, \infty)$
 local min: $x = -4$