MATH 110-001, QUIZ 3

February 16, 2018

Time: 10 minutes

Show all your work. No calculators, no books/notes are allowed.

Name (please print): _____

Student number: _____

1. Consider a function f whose derivative is given by

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

complete the following sign chart to determine the concavity of f and its inflection points. Also, write down the intervals where f is concave up and concave down.

We need to find $f''(x)$ by applying quotient rule.

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

$f''(x) = 0 \Rightarrow x(x-2) = 0 \Rightarrow x = 0$ or $x = 2$

$f''(x)$ NOT defined $\Rightarrow (x-1)^2 = 0 \Rightarrow x = 1$

x	$-\infty$		0		1		2		$+\infty$
		$x=-1$		$x=\frac{1}{2}$		$x=\frac{3}{2}$		test $x=3$	
$f''(x)$		$+$	0	$-$	∞	$-$	0	$+$	
$f(x)$		$\cup$	INF point	$\cap$		$\cap$	INF point	$\cup$	

$f'' =$ (always $+$)

$f''(3) = \frac{9-6}{+} > 0$

$f''(\frac{3}{2}) = \frac{\frac{9}{4} - \frac{6}{2}}{+} < 0$

$f''(\frac{1}{2}) = \frac{\frac{1}{4} - 1}{+} < 0$

$f''(-1) = \frac{1-2(-1)}{+} > 0$

Interval(s) where f is concave **up**: $(-\infty, 0)$, $(2, \infty)$

Interval(s) where f is concave **down**: $(0, 1)$, $(1, 2)$

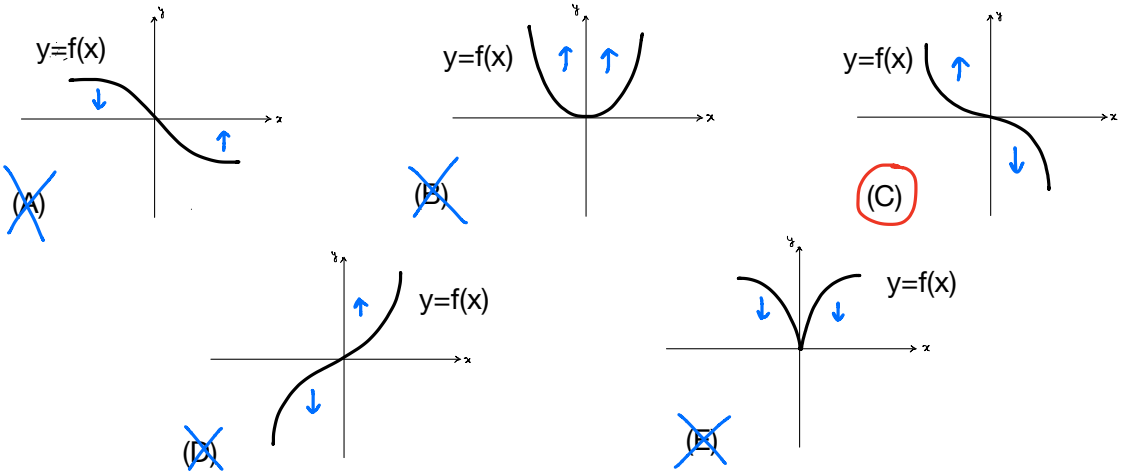
Inflection point(s) of f: $x = 0$, 2

2. Choose the graph of the function f for which

- $f''(x) > 0$ in $(-\infty, 0)$ ⟶ Concave up to the left of $x=0$

and

- $f''(x) < 0$ in $(0, \infty)$ ⟶ Concave down to the right of $x=0$



3. **(Bonus)** Choose three of the following resources that you will most likely use to prepare for the midterm:

Textbook	◯
Lecture notes	◯
WebWork problems	◯
Quiz/HW problems	◯
Workshop problems	◯
Past Exams (MER wiki page)	◯