Name:	ID:	Sec: 14 22

MATH-101 Term-131 IN-Class-QUIZ-15

(show all your work and circle one letter to get a full mark or you will get zero)

1) which one of the following statements is FALSE about the function $f(x)=(x-2)x^2(x+2)$

(a) The function f is concave up on the interval (1,2)
(b) The function f is concave down on (-0.5, 0.5)
(c) The function f has no inflection point
(d) f has only one local maximum
(e) The function f is concave up on the interval (-2,-1)
(f) The function f has local minimum at $x=\sqrt{2}$
(g) none of the above

$f(x)=x^2(x^2-4)=x^4-4x^2$
$f'(x)=4x^3-8x=4x(x^2-2)$
$=4x(x-\sqrt{2})(x+\sqrt{2})$
$f''(x)=12x^2-8=4(3x^2-2)$
$=4(\sqrt{3}x-\sqrt{2})(\sqrt{3}x+\sqrt{2})$

		$-\sqrt{2}$		0		$\sqrt{2}$	
f'	$-$	$\cup$	$+$	$\cap$	$-$	$\cup$	$+$

		$-\sqrt{2}/\sqrt{3}$		$\sqrt{2}/\sqrt{3}$	
f''	$+$		$-$		$+$
		≈ -0.81		≈ 0.81	

(a) True (d) True
(b) True (e) False
(c) False (f) ~~False~~ True
(g) False

2) If the function $f(x)=ax^3+bx+c$ has a local maximum value of 2 at x=1 then which of the following is TRUE for the function (you may select more than one)

× (a) $abc>0$
× (b) $a+b+c=0$
✓ (c) f concave up on (-10,-5)
✓ (d) f is increasing on (-1,-0.5)
✓ (e) $x=0$ is an inflection point.
(f) none of the above

local max at $x=1 \Rightarrow f'(1)=0,\ f''(1)<0$
local max value is 2 $\Rightarrow f(1)=2$
$f(1)=2 \Rightarrow a+b+c=2$
$f'(1)=0 \Rightarrow 3a+b=0$ $\Big\} \Rightarrow \boxed{b=-3a,\ c=2+2a}$
$f''(1)<0 \Rightarrow 6a<0 \Rightarrow a<0$ (negative)

$f'(x)=3ax^2+b$
$f''(x)=6ax$

f'	$\ominus$	-1	$\oplus$	1	$\ominus$
$3a$	$-$		$-$		$-$
$x-1$	$-$		$-$		$+$
$x+1$	$-$		$+$		$+$

f''	$\oplus$	0	$\ominus$
$6a$	$-$		$-$
x	$-$		$+$

Now, $f(x)=ax^3-3ax+(2+2a)$
$f(x)=a(x^3-3x+2)+2$
$=a(x-2)(x-1)+2$
$f'(x)=3ax^2-3a=3a(x^2-1)=3a(x-1)(x+1)$
$f''(x)=6ax$

3) If $f(x)=\dfrac{x^3+2x^2-1}{(x+1)^2}$, then an equation of the oblique asymptote for the graph of f is

(a) $y-x=0$
(b) $y-x-1=0$
(c) $y+x=0$
(d) $y-x-1=0$
(e) f does not have an oblique asymptote
(f) none of the above

$$\begin{array}{r|l} & x \\ \hline x^2+2x+1 & x^3+2x^2-1 \\ & \mp x^3 \mp 2x^2 \mp x \\ \hline & -x-1 \end{array}$$

$f(x)=x+\dfrac{-x-1}{(x+1)^2}$

So $y=x$ is an oblique