[2] SUPPOSE $f(3)=17$

SINCE f IS DIFFERENTIABLE ON $[-1,3]$, $\frac{1}{2}$

THEREFORE f IS CONTINUOUS ON $[-1,3]$, $\frac{1}{2}$

AND BY MVT, FOR SOME $c \in (-1,3)$ $\frac{1}{2}$

$\frac{1}{2}$

$$f'(c) = \frac{f(3)-f(-1)}{3-(-1)} = \frac{17--2}{4} = \frac{19}{4} < 5$$ 1

BUT $f'(x) > 5$ ON $[-1,3]$ (CONTRADICTION)

SO, IT IS $\frac{1}{2}$ NOT POSSIBLE THAT $f(3)=17$

[3][a] $\lim_{x\to\frac{\pi}{2}} (1-2\cos x)^{\tan x} = \lim_{x\to\frac{\pi}{2}} e^{\tan x \ln(1-2\cos x)}$

$(1-0)^{\infty} \to 1^{\infty}$

or $(1-0)^{-\infty} \to 1^{-\infty} \to \frac{1}{1^{\infty}}$

$= e^{\lim_{x\to\frac{\pi}{2}} \tan x \ln(1-2\cos x)}$ (1) $= e^{-2}$ (1)

(1) $\boxed{\lim_{x\to\frac{\pi}{2}} \frac{\ln(1-2\cos x)}{\cot x}} = \boxed{\lim_{x\to\frac{\pi}{2}} \frac{\frac{1}{1-2\cos x} 2\sin x}{-\csc^2 x}}$ (2) $= \boxed{\lim_{x\to\frac{\pi}{2}} -\frac{2\sin^3 x}{1-2\cos x}}$ ($\frac{1}{2}$)

$= \frac{-2(1)^3}{1-0} = -2$ ($\frac{1}{2}$)

[b] $\boxed{\lim_{x \to \infty} \frac{7+2x}{\sqrt[3]{5-4x^3}} \cdot \frac{\frac{1}{x}}{\frac{1}{\sqrt[3]{x^3}}}} = \boxed{\lim_{x \to \infty} \frac{\frac{7}{x}+2}{\sqrt[3]{\frac{5}{x^3}-4}}} = \frac{0+2}{\sqrt[3]{0-4}} = -\frac{2}{\sqrt[3]{4}} \cdot \frac{\sqrt[3]{2}}{\sqrt[3]{2}}$

$\frac{1}{2}$ $\quad$ 1

$= \underline{-\sqrt[3]{2}}$ $\frac{1}{2}$

[4] YES. f IS CONTINUOUS ON $(0, \infty)$ (1/2) WHICH INCLUDES $[e^{-1}, e^2]$

$$f'(x) = \boxed{\frac{(2\ln x)\frac{1}{x}x^3 - (\ln x)^2 3x^2}{(x^3)^2}} \ (3) = \frac{2\ln x - 3(\ln x)^2}{x^4} \text{ EXISTS ON } [e^{-1}, e^2]$$

$$f'(x) = \boxed{\frac{(\ln x)(2 - 3\ln x)}{x^4}} \ (1) = 0 \text{ IF } \ln x = 0 \text{ OR } 2 - 3\ln x = 0$$

IE. (1/2) $x = 1$ OR $x = e^{\frac{2}{3}}$ (1/2)

BOTH IN $[e^{-1}, e^2]$

$$f(e^{-1}) = \frac{(-1)^2}{(e^{-1})^3} = e^3 \ (1/2) > 1$$

$$f(1) = \frac{0^2}{1^3} = 0 \ (1/2)$$

$$f(e^{\frac{2}{3}}) = \frac{(\frac{2}{3})^2}{(e^{\frac{2}{3}})^3} = \frac{4}{9e^2} \ (1/2) < 1$$

$$f(e^2) = \frac{(2)^2}{(e^2)^3} = \frac{4}{e^6} \ (1/2) < 1$$

GLOBAL MAX

AT (e^{-1}, e^3) (1/2)

[5] $\frac{1}{2}$ BQ IS RIGHT. $f'(x) = \frac{1}{3}x^{-\frac{2}{3}}$ $\frac{1}{2}$ SO f IS NOT DIFFERENTIABLE

AT $x = 0 \in (-1, 8)$. SO MVT DOES NOT APPLY

$\frac{1}{2}$

[6][a] $f(x) = 14x^{\frac{10}{3}} + 40x^{\frac{7}{3}} + 35x^{\frac{4}{3}}$ DOMAIN $= (-\infty, \infty)$ $\frac{1}{2}$

$f'(x) = \frac{140}{3}x^{\frac{7}{3}} + \frac{280}{3}x^{\frac{4}{3}} + \frac{140}{3}x^{\frac{1}{3}} = \frac{140}{3}(x^{\frac{7}{3}} + 2x^{\frac{4}{3}} + x^{\frac{1}{3}})$ 1

EXISTS ON $(-\infty, \infty)$

$f'(x) = \frac{140}{3}x^{\frac{1}{3}}(x^2 + 2x + 1) = \frac{140}{3}x^{\frac{1}{3}}(x+1)^2 = 0$ 1

IF $x^{\frac{1}{3}} = 0$ OR $(x+1)^2 = 0$

IE. IF $x = 0$ OR $x = -1$ $\frac{1}{2}$ $\frac{1}{2}$

[b] $f''(x) = \frac{140}{3}\left(\frac{7}{3}x^{\frac{4}{3}} + \frac{8}{3}x^{\frac{1}{3}} + \frac{1}{3}x^{-\frac{2}{3}}\right) = \frac{140}{9}x^{-\frac{2}{3}}(7x^2 + 8x + 1)$ (1)

$f'(0) = 0$ BUT $f''(0)$ DNE (1/2) $\rightarrow$ 2^{ND} DERIVATIVE TEST TELLS US NOTHING (1)

$f'(-1) = 0$ BUT $f''(-1) = 0$ (1/2) $\rightarrow$ 2^{ND} DERIVATIVE TEST TELLS US NOTHING (1)

0 POINTS IF YOU SAID "NOT AN EXTREMA"

[c]

$\frac{140}{3}x^{\frac{1}{3}}$	$-$		$-$		$+$	1
$(x+1)^2$	$+$		$+$		$+$	1
	$\searrow$	-1	$\searrow$	0	$\nearrow$	
f'	$-$		$-$		$+$	1

f HAS A LOCAL MIN AT $x = 0$ $\frac{1}{2}$

f HAS NO LOCAL EXTREMA AT $x = -1$ $\frac{1}{2}$

[d] $f''(x) = \frac{140}{9}x^{-\frac{2}{3}}(7x+1)(x+1)$ 1 DNE AT $x=0$ 1

$=0$ AT $x=-1$, $-\frac{1}{7}$ $\frac{1}{2}$ $\frac{1}{2}$

$\frac{140}{9}x^{-\frac{2}{3}}$	+	+	+	+ 1
$7x+1$	−	−	+	+ 1
$x+1$	−	+	+	+ 1

-1 $\quad -\frac{1}{7} \quad 0$

f''	+	−	+	+ 1

f HAS INFLECTION POINTS AT $x=-1$ AND $x=-\frac{1}{7}$ $\frac{1}{2}$