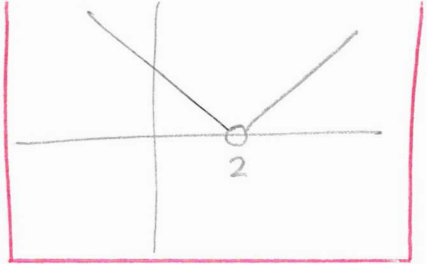
[2] BG IS WRONG, BECAUSE f MIGHT NOT BE CONTINUOUS AT $x=2$



[3] DOMAIN OF f IS $x > 0$ AND $1 + \ln x \neq 0$
($\ln x$ DNE IF $x \leq 0$) $\quad \ln x \neq -1$

$x \neq e^{-1}$ OR $\frac{1}{e} \approx \frac{1}{3}$

DISCONTINUOUS ON $(-\infty, 0]$ AND AT $x = \frac{1}{e}$

$f(0)$ DNE $\longrightarrow$ NO y-INT

$\frac{1}{1+\ln x} = 0 \longrightarrow$ NO SOL'N $\longrightarrow$ NO X-INT

$$\lim_{x \to 0^+} \frac{1}{1+\ln x} = 0$$

$$\frac{1}{1-\infty} \to \frac{1}{-\infty}$$

$$\lim_{x \to \frac{1}{e}^+} \frac{1}{1+\ln x} = \infty \qquad \lim_{x \to \frac{1}{e}^-} \frac{1}{1+\ln x} = -\infty \qquad \text{V.A. @ } x = \frac{1}{e}$$

$$\frac{1}{1+(-1)^+} \to \frac{1}{0^+} \qquad \frac{1}{1+(-1)^-} \to \frac{1}{0^-}$$

$$\lim_{x \to \infty} \frac{1}{1+\ln x} = 0 \qquad \lim_{x \to -\infty} \frac{1}{1+\ln x}$$ DNE SINCE DOMAIN EXCLUDES $x < 0$

$$\frac{1}{1+\infty} \to \frac{1}{\infty} \qquad \text{H.A. @ } y = 0$$

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

$f'(x) = -x^{-1}(1+\ln x)^{-2}$ DNE @ $x \leq 0$ AND $x = \frac{1}{e}$
NOT IN DOMAIN

$= -\frac{1}{x(1+\ln x)^2}$ IS NEVER 0 $\longrightarrow$ NO CRITICAL NUMBERS

$f''(x) = x^{-2}(1+\ln x)^{-2} + 2x^{-1}x^{-1}(1+\ln x)^{-3}$

$= x^{-2}(1+\ln x)^{-3}(1+\ln x+2)$

$= x^{-2}(1+\ln x)^{-3}(3+\ln x)$ DNE @ $x \leq 0$ AND $x = \frac{1}{e}$
NOT IN DOMAIN

$= \frac{3+\ln x}{x^2(1+\ln x)^3} = 0$ @ $3 + \ln x = 0$

$\ln x = -3$

$f(e^{-3}) = \frac{1}{1+\ln e^{-3}} = \frac{1}{1-3} = -\frac{1}{2} \qquad x = e^{-3} = \frac{1}{e^3} \approx \frac{1}{27}$

$$\lim_{x\to0^+} -x^{-1}(1+\ln x)^{-2} = \lim_{x\to0^+}\frac{-x^{-1}}{(1+\ln x)^2} = \lim_{x\to0^+}\frac{x^{-2}}{2(1+\ln x)x^{-1}}$$

$$-\infty\cdot(1-\infty)^{-2}\to -\infty\cdot(-\infty)^{-2}\to -\infty\cdot 0$$

$$= \lim_{x\to0^+}\frac{x^{-1}}{2(1+\ln x)} \qquad \frac{\infty}{-\infty}$$

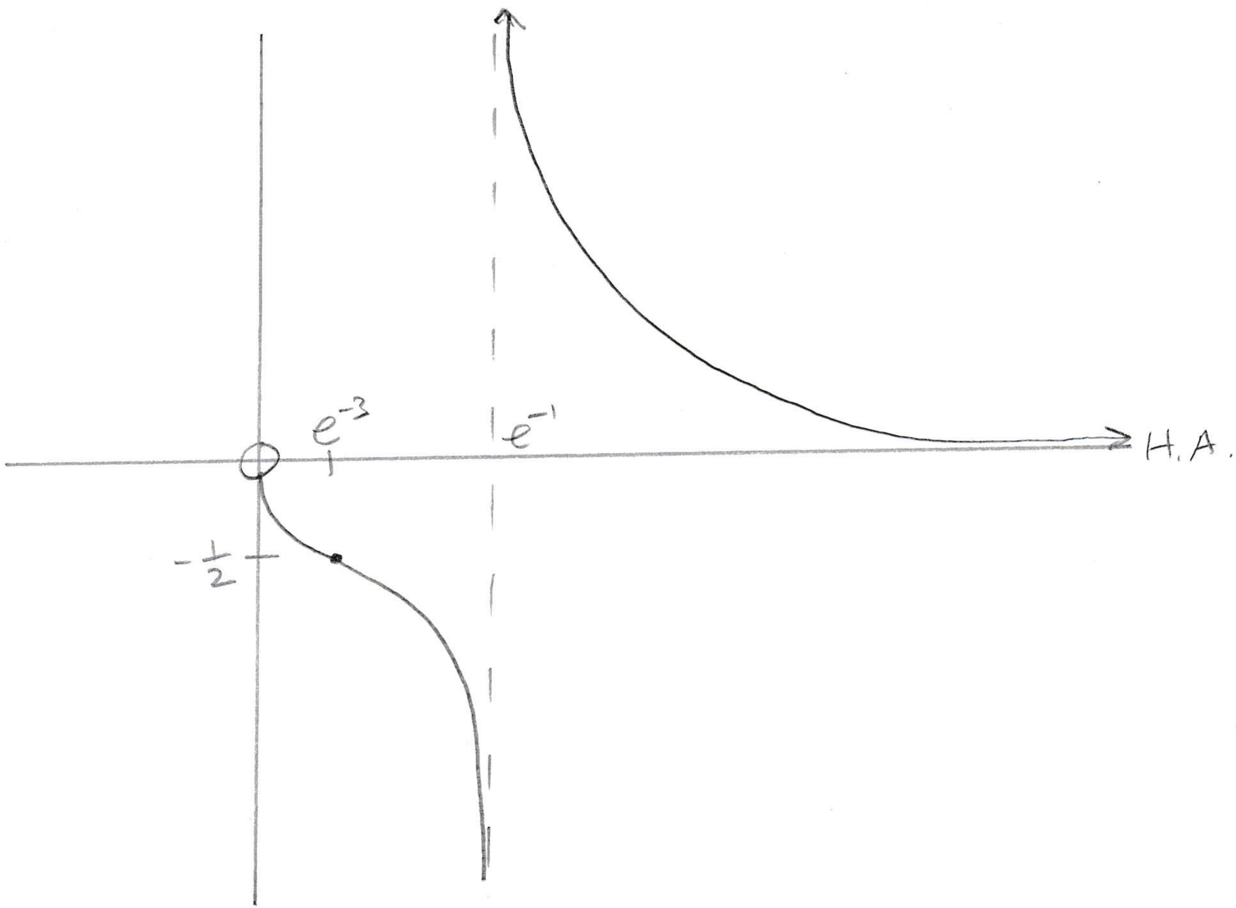
$$= \lim_{x\to0^+}\frac{-x^{-2}}{2x^{-1}}$$

$$= \lim_{x\to0^+} -\frac{1}{2x} = -\infty$$

$$-\frac{1}{0^+}$$

APPROACHING VTL AS $x\to 0^+$

	0		e^{-3}		e^{-1}	
	$\to (0,0)$ $\to$ VTL		$(e^{-3}, -\frac{1}{2})$		VA	
$-\frac{1}{x}$		$-$		$-$		$-$
$\frac{1}{(1+\ln x)^2}$		$+$		$+$		$+$
$3+\ln x$		$-$		$+$		$+$
$\frac{1}{x^2}$		$+$		$+$		$+$
$\frac{1}{(1+\ln x)^3}$		$-$		$-$		$+$
f'		$-$		$-$		$-$
f''		$+$	$\xrightarrow{\text{IP}}$	$-$	$\xrightarrow{}$ NOT CONT.	$+$



e^{-3}
e^{-1}
H. A.
$-\frac{1}{2}$

[4] $\boxed{\text{B6 IS WRONG, BECAUSE } f'' \text{ MIGHT NOT CHANGE SIGNS AT } x=2}$

$f(x) = (x-2)^4$

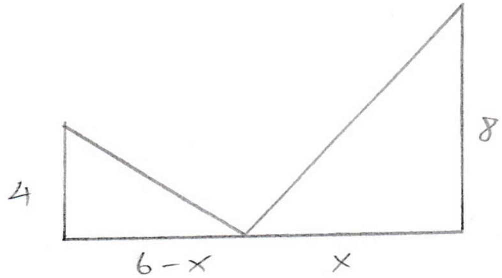
$f'(x) = 4(x-2)^3$

$f''(x) = 12(x-2)^2 \longrightarrow f''(2) = 0$ BUT $f''(x) > 0$ FOR ALL $x \neq 2$

SO f IS CONCAVE UP ON $(-\infty, \infty)$

IE, NO CHANGE IN CONCAVITY, SO NO INFLECTION POINTS

[5]



MINIMIZE $\boxed{d = \sqrt{x^2+64} + \sqrt{(6-x)^2+16}}$

$\boxed{x \in [0,6]}$

$$d' = \boxed{\tfrac{1}{\cancel{2}}(x^2+64)^{-\frac{1}{2}}(\cancel{2}x) + \tfrac{1}{\cancel{2}}((6-x)^2+16)^{-\frac{1}{2}}\cancel{2}(6-x)(-1)}$$

$$= \boxed{\frac{x}{\sqrt{x^2+64}} - \frac{6-x}{\sqrt{(6-x)^2+16}}}$$

EXISTS ON [0, 6]

(BOTH RADICANDS ARE POSITIVE)

$$\frac{x}{\sqrt{x^2+64}} - \frac{6-x}{\sqrt{(6-x)^2+16}} = 0$$

$$\frac{x}{\sqrt{x^2+64}} = \frac{6-x}{\sqrt{(6-x)^2+16}}$$

$$\frac{x^2}{x^2+64} = \frac{(6-x)^2}{(6-x)^2+16}$$

$$\cancel{x^2(6-x)^2} + 16x^2 = \cancel{x^2(6-x)^2} + 64(6-x)^2$$

$$x^2 = 4(6-x)^2$$

$$\pm x = 2(6-x)$$

$x = 12 - 2x$ OR $-x = 12 - 2x$

$3x = 12$ $\qquad$ $\cancel{x = 12}$

$x = 4$ $\qquad$ NOT IN [0, 6]

$$d(0) = \sqrt{64} + \sqrt{52} = 8 + 2\sqrt{13} > 14$$

$$d(4) = \sqrt{80} + \sqrt{20} = 4\sqrt{5} + 2\sqrt{5} = 6\sqrt{5} = \sqrt{180}$$

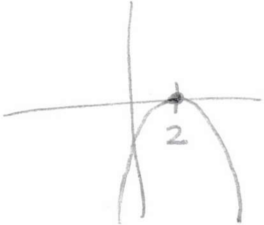
$$d(6) = \sqrt{100} + \sqrt{16} = 14 = \sqrt{196}$$

$d(4)$ IS MINIMUM

YOU SHOULD WALK TO THE POINT ON THE ROAD 200 FT DOWN THE ROAD FROM CG'S HOUSE

[6] $\boxed{\text{B6 IS WRONG}}$

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



f IS CONT + DIFF ON $(-\infty,\infty)$ SINCE f IS POLYNOMIAL

BUT $\boxed{f''(2) = 0}$

[7] $\boxed{\lim_{x\to 0^+} \dfrac{2x-1+\sec^2 x}{4x^3-6x^2}} = \boxed{\lim_{x\to 0^+} \dfrac{2+2\sec^2 x\tan x}{12x^2-12x}} = \boxed{\lim_{x\to 0^+} \dfrac{2+2\sec^2 x\tan x}{12x(x-1)}}$

$\dfrac{0-1+1}{0-0} \to \dfrac{0}{0}$ $\quad\quad$ $\dfrac{2+0}{0-0} \to \dfrac{2}{0}$ $\quad\quad$ $\boxed{\dfrac{2}{0^+(-1)} = -\infty}$