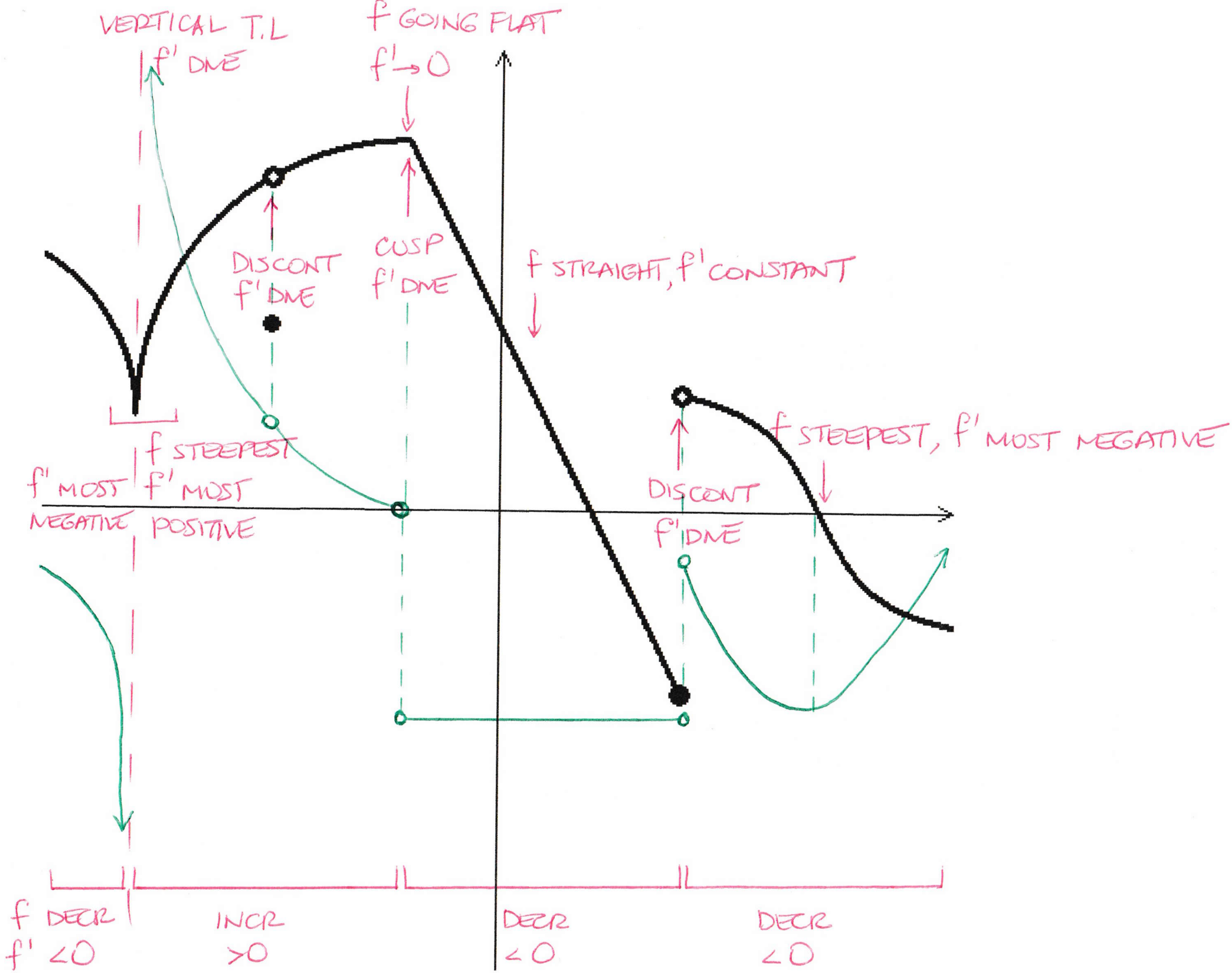
[2] $\lim_{x \to -3^+} (3f(x) - [g(x)]^2) = \boxed{3 \lim_{x \to -3^+} f(x) - [\lim_{x \to -3^+} g(x)]^2}$ $3\frac{1}{2}$

$= \boxed{3(4) - [-3]^2}$ 4 $= 12 - 9 = \boxed{3}$ 1

$\lim_{x \to -3^-} (3f(x) - [g(x)]^2) = \boxed{3 \lim_{x \to -3^-} f(x) - [\lim_{x \to -3^-} g(x)]^2}$ $3\frac{1}{2}$

$= \boxed{3(1) - [0]^2}$ 4 $= 3 - 0 = \boxed{3}$ 1

$\boxed{\lim_{x \to -3} (3f(x) - [g(x)]^2) = 3}$ 3



VERTICAL T.L
f' DNE
f GOING FLAT
f' → 0
DISCONT
f' DNE
CUSP
f' DNE
f STRAIGHT, f' CONSTANT
f STEEPEST
f' MOST
POSITIVE
f' MOST
NEGATIVE
DISCONT
f' DNE
f STEEPEST, f' MOST NEGATIVE
f DECR
f' <0
INCR
>0
DECR
<0
DECR
<0

[4] $\boxed{\lim_{x\to 2^+} \frac{x}{6-x-x^2}} = \boxed{\lim_{x\to 2^+} \frac{x}{(2-x)(3+x)}} = -\infty$ 3

3

$\frac{2}{0}$

$\boxed{\frac{2}{0^-(5)} \to \frac{2}{0^-} \to -\infty}$ 4

3 $\boxed{e^x \text{ CONT ON } (-\infty,\infty)}$

$\lim_{x\to 2^+} e^{\frac{x}{6-x-x^2}} = \boxed{\lim_{t\to -\infty} e^t} = \boxed{0}$ 3

4

[5] [b] $f'(x) = \boxed{\lim_{h \to 0} \frac{4(x+h)^2 - 2(x+h)^3 - (4x^2 - 2x^3)}{h}}$ 5

$$= \lim_{h \to 0} \frac{4(x^2 + 2xh + h^2) - 2(x^3 + 3x^2h + 3xh^2 + h^3) - 4x^2 + 2x^3}{h}$$

$$= \boxed{\lim_{h \to 0} \frac{\cancel{4x^2} + 8xh + 4h^2 - \cancel{2x^3} - 6x^2h - 6xh^2 - 2h^3 - \cancel{4x^2} + \cancel{2x^3}}{h}}$$ 8

$$= \boxed{\lim_{h \to 0} (8x + 4h - 6x^2 - 6xh - 2h^2)}$$ 4

$$= \boxed{8x - 6x^2}$$ 3

[c] 1:30 pm $\longrightarrow t = \frac{1}{2}$ $\quad v(\tfrac{1}{2}) = \boxed{s'(\tfrac{1}{2})}$ 3 $= 8(\tfrac{1}{2}) - 6(\tfrac{1}{2})^2 = \boxed{\tfrac{5}{2}}$ 3 $\boxed{\frac{\text{YARDS}}{\text{HOUR}}}$ 3

[d] $\frac{d^2y}{dx^2} = f''(x) = \boxed{\lim_{h \to 0} \frac{8(x+h) - 6(x+h)^2 - (8x - 6x^2)}{h}}$ 5

$$= \lim_{h \to 0} \frac{8x + 8h - 6(x^2 + 2xh + h^2) - 8x + 6x^2}{h}$$

$$= \boxed{\lim_{h \to 0} \frac{\cancel{8x} + 8h - \cancel{6x^2} - 12xh - 6h^2 - \cancel{8x} + \cancel{6x^2}}{h}}$$ 6

4 $= \boxed{\lim_{h \to 0} (8 - 12x - 6h)} = \boxed{8 - 12x}$ 3

$\left.\frac{d^2y}{dx^2}\right|_{x=2}$ 3

$= 8 - 12(2) = \boxed{-16}$

[6] [a] $\boxed{f \text{ IS RATIONAL, SO } f \text{ IS CONT ON ITS DOMAIN}}$ 3

$x - 2x^2 + x^3 \neq 0$ $\quad x \in \boxed{(-\infty, 0), (0, 1), (1, \infty)}$ 3

$x(1 - 2x + x^2) \neq 0$

$\boxed{x(1-x)^2 \neq 0}$ 2

$\boxed{x \neq 0, 1}$ 2

[b] $\boxed{\lim_{x \to 0} \frac{x - x^3}{x - 2x^2 + x^3}}$ 2 $= \lim_{x \to 0} \frac{x(1-x^2)}{x(1-x)^2} = \boxed{\lim_{x \to 0} \frac{1+x}{1-x} = 1}$ 3 BUT $\boxed{f(0) \text{ DNE}}$ 1

$x = 0$ $\boxed{\text{REMOVABLE DISCONTINUITY}}$ 2

2 $\boxed{\lim_{x \to 1^-} \frac{1+x}{1-x}} = \infty$ $\quad x = 1$ $\boxed{\text{INFINITE DISCONTINUITY}}$ 2

$\boxed{\frac{2}{0^+} \to \infty}$ 3

OR

$\lim_{x \to 1^+} \frac{1+x}{1-x} = -\infty$ $\quad x = 1$ INFINITE DISCONTINUITY

$\frac{2}{0^-} \to -\infty$

[7] $f'(a) = \lim_{h\to 0} \frac{f(a+h)-f(a)}{h} = \lim_{h\to 0} \frac{\arcsin(h-\frac{1}{2})+\frac{\pi}{6}}{h}$

$f(a+h) = \arcsin(h-\frac{1}{2}) = \arcsin(-\frac{1}{2}+h)$

4 $\boxed{f(x) = \arcsin x}$, $\boxed{a = -\frac{1}{2}}$ 4

$\lim_{h\to 0} \frac{f(a+h)-f(a)}{h} = \lim_{h\to 0} \frac{\arcsin(-\frac{1}{2}+h) - \arcsin(-\frac{1}{2})}{h}$

$= \lim_{h\to 0} \frac{\arcsin(h-\frac{1}{2}) - \boxed{-\frac{\pi}{6}}}{h}$ 2

$= \lim_{h\to 0} \frac{\arcsin(h-\frac{1}{2})+\frac{\pi}{6}}{h}$

[8] (4) $\boxed{\lim_{x\to\infty} \frac{\sqrt{3x^2+x}}{2-5x}} \cdot \frac{\frac{1}{x}}{\frac{1}{x}} =$ (3) $\boxed{\lim_{x\to\infty} \frac{\sqrt{3x^2+x}\,\sqrt{\frac{1}{x^2}}}{\frac{2}{x}-5}}$

$\frac{\infty}{-\infty}$

$=$ (2) $\boxed{\lim_{x\to\infty} \frac{\sqrt{3+\frac{1}{x}}}{\frac{2}{x}-5}} = \frac{\sqrt{3+0}}{0-5} =$ (1) $\boxed{-\frac{\sqrt{3}}{5}}$

(4) $\boxed{\lim_{x\to-\infty} \frac{\sqrt{3x^2+x}}{2-5x}} \cdot \frac{\frac{1}{x}}{\frac{1}{x}} =$ (3) $\boxed{\lim_{x\to\infty} \frac{\sqrt{3x^2+x} \cdot -\sqrt{\frac{1}{x^2}}}{\frac{2}{x}-5}}$

$\frac{\infty}{\infty}$

$=$ (2) $\boxed{\lim_{x\to\infty} \frac{-\sqrt{3+\frac{1}{x}}}{\frac{2}{x}-5}} = \frac{-\sqrt{3+0}}{0-5} =$ (1) $\boxed{\frac{\sqrt{3}}{5}}$

(2) (2) (1)

H.A. $\boxed{y =} \boxed{\pm} \boxed{\frac{\sqrt{3}}{5}}$

NOTE: $\sqrt{x^2} = |x|$ (NOT $x$)

SO, $\sqrt{\frac{1}{x^2}} = \left|\frac{1}{x}\right| = \begin{cases} \frac{1}{x}, & \text{IF } x>0 \\ -\frac{1}{x}, & \text{IF } x<0 \end{cases}$

SO, IF $x<0$, $\frac{1}{x} = -\sqrt{\frac{1}{x^2}}$