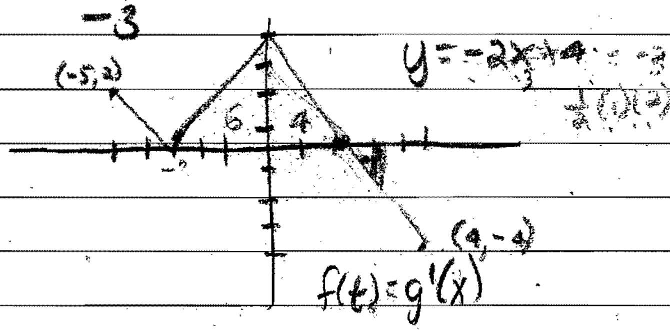
Calculator

③ $g(x) = \int_{-3}^{x} \underbrace{f(t)}_{g'(x)}\,dt$ graph is $f = g'$

a) $g(3) = \int_{-3}^{3} f(t)\,dt = 6 + 4 - 1 = \boxed{9}$ ②



b) g inc where g' is positive
g ccd where g'' neg → g' decreasing
$\boxed{(-5,-3)\quad(0,2)^{*}}$ ②

c) $h(x) = \dfrac{g(x)}{5x}$

$h'(x) = \dfrac{5x\,g'(x) - g(x)\,5}{(5x)^2}$ ②

$h'(3) = \dfrac{15(-2) - 9(5)}{225} = \dfrac{-30-45}{225} = \dfrac{-75}{225} = \boxed{\dfrac{-1}{3}}$

d) $p(x) = f(x^2 - x)$
$p'(x) = f'(x^2 - x)\,(2x-1)$
$p'(-1) = f'(1-(-1))\,(-2-1)$
$= f'(2)\,(-3)$ $f'(2)$ is slope at $2 = -2$
$= -2(-3) = \boxed{6}$ ③

AB/BC

4 a) $\frac{V_A(8)-V_A(2)}{8-2} = \frac{-120-100}{8-2} = \frac{-220}{6}$

$\boxed{-110/3}$ m/min²

2 b) find if diff/cont.

Yes, sint $V_A(t)$ is diff/cont.

Since $V_A(5)=40$ and $V_A(8)=-120$,

$V_A(t)$ must pass through -100. (IVT)

c) $300+\int_2^{12} V_a(t)\,dt$

3

trapezoid sum

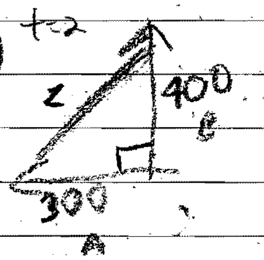
$=\frac{1}{2}(3)(100+40)+\frac{1}{2}(3)(40+-120)+\frac{1}{2}(4)(-120+-150)$

$= 210 + (-120) + (-540) = -450$

$300 + -450 = \boxed{-150}$

150 meters west of station

d)



Train B

$V_A(2) = -5(2)^2+60(2)+25$

$= -20+120+25$

$= 125$

$x=300$

$\frac{dx}{dt}=100$

$x^2+y^2=z^2$

$y=400$

$\frac{dy}{dt}=125$

$\cancel{2}x\frac{dx}{dt}+\cancel{2}y\frac{dy}{dt}=\cancel{2}z\frac{dz}{dt}$

$z=500$

$100(300)+400(125) = 500\frac{dz}{dt}$

$300 + 500 = 5\frac{dz}{dt}$ $\quad \frac{800}{5}$

$\boxed{160 = \frac{dz}{dt}}$ m/min

AB/BC

5 a) rel min. where f ' changes from negative to positive
$x = 1$

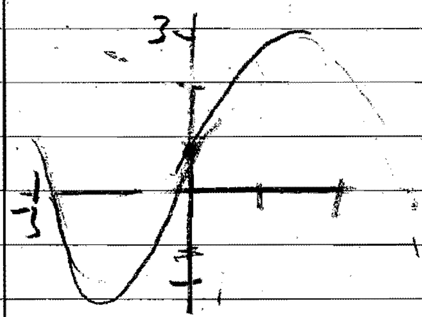
b) By Rolles Thm since f is cont/diff and $f'(1) = f'(-1)$, there is a place where $f''(x) = 0$

c) $h(x) = \ln(f(x))$
$h'(x) = \frac{f'(x)}{f(x)}$
$h'(3) = \frac{f'(3)}{f(3)} = \frac{1/2}{7} = \frac{1}{2} \cdot \frac{1}{7} = \boxed{1/14}$

d) $\int_{-2}^{3} f'(g(x))\, g'(x)\, dx$
$f(g(x))\Big|_{-2}^{3} = f(g(3)) - f(g(-2))$
$f(1) - f(-1)$
$2 - 8 = \boxed{-6}$

AB/BC

(6) a)



(2)

b) (0,1) $\frac{dy}{dx} = (3-1)\cos(0)$

$dy/dx = 2(1) = 2$

$\boxed{y-1 = 2(x-0)}$ $y = 2x+1$ (1)

$y-1 = 2(.2)$

$y-1 = .4$ $\boxed{y = 1.4}$ (1)

c) $\frac{dy}{dx} = (3-y)\cos x$ (0,1)

$u = 3-y$
$du = -1$

$\int \frac{1}{3-y}\,dy = \int \cos x\,dx$ (1)

$-\ln|3-y| = \sin x + C$ (2)

$-\ln 2 = \sin(0) + C$

$-\ln 2 = C$ (1)

$-\ln|3-y| = \sin x - \ln 2$

$\ln|3-y| = -\sin x + \ln 2$

$|3-y| = e^{-\sin x + \ln 2}$

$|3-y| = e^{-\sin x} \cdot 2$

$3-y = \pm 2e^{-\sin x}$

$-y = \pm 2e^{-\sin x} - 3$ (1)

$\boxed{y = -2e^{-\sin x} + 3}$ or $y = 3 - e^{(\ln 2 + \sin x)}$