Chapter 3

(1) $g(x) = (2x+4)^3(x-6)$ $\quad u=(2x+4)^3 \quad du = 3(2x+4)^2(2)$

$v = (x-6) \quad dv = 1$

(a) CRITICAL #'s OF g

$g'(x) = u\,dv + v\,du$

$(2x+4)^3 + (x-6)(6)(2x+4)^2$

$(2x+4)^2[(2x+4) + 6x - 36]$

$(2x+4)^2[8x - 32]$

$2x+4=0 \qquad 8x-32=0$

$\boxed{x=-2} \qquad 8x=32$

$\boxed{x=4}$

	SIGN OF f'	beh of f
(b) $(-\infty, -2)$	$f'(x)<0$	DEC
$x=-2$	0	
$(-2, 4)$	$f'(x)<0$	DEC
$x=4$	0	
$(4, \infty)$	$f'(x)>0$	INC

(c) REL MIN AT $x=4$ $\quad f(x)$ changes from DEC TO INC

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(2) $f(x) = 2x + \cos(2x)$ $\quad f'(x) = 2 - 2\sin(2x)$

(a) $f(0) = 0 + 1 = 1$

$f(\pi) = 2\pi + 1$ * MAX

$f(\frac{\pi}{4}) = \frac{\pi}{2} + 1$

$0 = 2 - 2\sin(2x)$

$-2 = -2\sin(2x)$

$1 = \sin(2x)$

$\frac{\pi}{2} = 2x$

$x = \frac{\pi}{4}$

(b) MVT $\quad \frac{1 + 2\pi - 1}{\pi - 0} = \frac{2\pi}{\pi} = 2$

Since $f(x)$ is both Continuous & DIFFERENTIAL THE MVT APPLIES AND THERE EXIST AT LEAST 1 pt WHERE $f'(n) = 2$

$f'(x) = 2 - 2\sin(2x)$

$2 = 2 - 2\sin(2x)$

$0 = -\sin(2x)$

$x = \frac{\pi}{2}$

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(3) $f(x) = \frac{1-4x^2}{x}$ $\quad u \quad v$ $\quad du = -8x \quad dv = 1$

a) $f'(x) = \frac{v\,du - u\,dv}{v^2} = \frac{-8x^2 - (1-4x^2)}{x^2}$

$f'(x) = \frac{-4x^2 - 1}{x^2}$

(b) $x = 0$ undefined there is A VERT ASYMPT.

c) $f''(x) = \frac{x^2(-8x) - (-4x^2-1)(2x)}{x^4}$

$\frac{-8x^3 + 8x^3 + 2x}{x^4}$

$f''(x) = \frac{2}{x^3}$ $\quad x = 0$ UND

	SIGN f''	beh of f
$(-\infty, 0)$	$f''(x) < 0$	CONC. down
$x = 0$	UND	
$(0, \infty)$	$f''(x) > 0$	CONC up

$(-\infty, 0)$

d) NO pts of Inf. AT $x = 0$ $f(x)$ D's from CC down to CC up but $f(x)$ is UNDEFINED AT $x = 0$

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(4)

	$f'(x)$
$x = -.5$	0
$x = 1.3$	0

a) $x=0$ RSC Min
$f'(x)$ is neg from $(-\infty, 0)$ AND pos $(0, 2)$?

b) INC $(0, 2)$ slopes ARE positive

c) CC DOWN $(-2, -0.8)$ & $(1.3, \infty)$
SLOPE OF $f(x)$ IS NEGATIVE

d) $\dfrac{f(-.5) - f(0)}{-.5 - 0}$ —

$f'(x)$ graph shows slopes below x-Axis

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(5) AT 3:30 AM ≈ 5.8 m

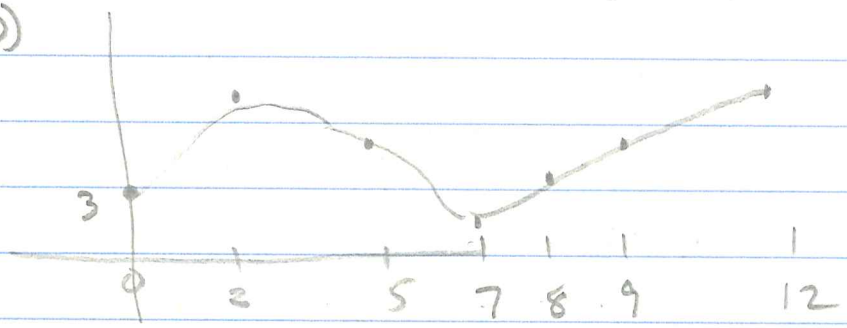
$$\frac{6.7-4.9}{2} = .9$$

AT 7:40

$$2.3-3.1 \quad \frac{-.8(2)}{3} = -.533 = 3.366$$

$$\frac{5.8\text{m} - 3.366\text{ m}}{3\frac{1}{6}\text{ hrs}} \qquad \boxed{.768\text{ m/hr}}$$

(b)



Two times on (0,2) water level is inc, Then From (2,7) water level is DEC, Then From 7,12 water level is inc.

c) $m = \frac{4.9-4.7}{5-2} = \frac{-1.8}{3} = -.6$

$y = -.6x + b$

$6.7 = -.6(2) + b$

$7.9 = b$

$y = -.6x + 7.9$

$y = -.6(25) + 7.9$

$-1.5 \quad 17.9$

$\boxed{y = 6.4\text{ m}}$

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(6)

a) $f'(1) = \frac{0+1}{-3-0} \quad \frac{1}{-3}$ $(-3,0)$ $(0,-1)$

$m = -\frac{1}{3}$

$y+1 = -\frac{1}{3}(x)$

$y = -\frac{1}{3}x - 1$

$y = -\frac{1}{3}(-1) - 1$

$y = -\frac{2}{3}$

$f'(-1) = -\frac{2}{3}$

b) $f'(-1) = -\frac{1}{3}$

c) $(-5,-4)$ $f'(x) > 0$

$(-4,0)$ $f'(x) < 0$ > POI

$(0,1)$ $f'(x) > 0$ > POI

$(1,4)$ $f'(x) < 0$ > POI

$x = -4, \; x = 0, \; x = 1$

d) $g(x) = f'(x) + 2\cos x \sin x$

$g(-\frac{\pi}{4}) = f'(-\frac{\pi}{4}) + 2\left(\frac{\sqrt{2}}{2}\right)\left(-\frac{\sqrt{2}}{2}\right)$

$- \quad + \quad -1$

DECREASING

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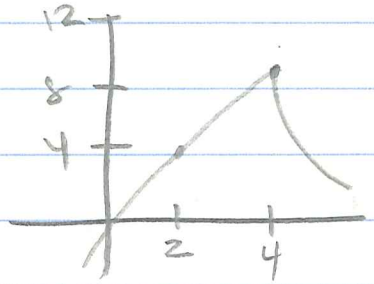
(7) A) $(-\infty, 4)$

b) YES SLOPE GOES FROM + TO − AT $x=4$

c) $x=4$ GRAPH GOES FROM CONCAVE UP TO CONCAVE DOWN

d) THE MVT DOES NOT APPLY SINCE THE FUNCTION IS NOT DIFFERENTIABLE AT $x=4$

e)



(8) D

(9) C

(10) E