#25

p 181 - 82 : 5, 6, 7, 8, 9, 17

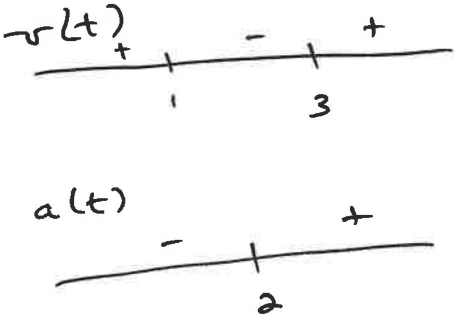
6. ANSWERS ARE APPROXIMATE

a. $v(t) > 0$ ON $(0,1)$ AND $(3,4)$

$v(t) < 0$ ON INTERVAL $(1,3)$

SPEEDING UP ON $(1,2)$ AND $(3,4)$

SLOWING DOWN ON $(0,1)$ AND $(2,3)$

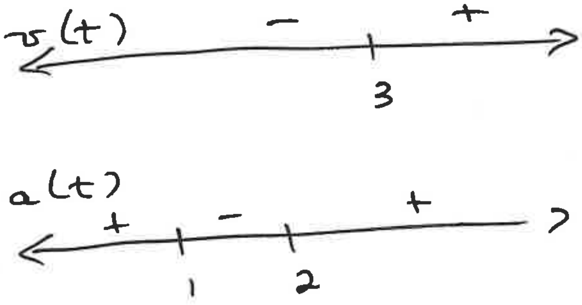


b. $v(t) > 0$ ON $(3,4)$

$v(t) < 0$ ON $(0,3)$

SPEEDING UP ON $(1,2)$ AND $(3,4)$

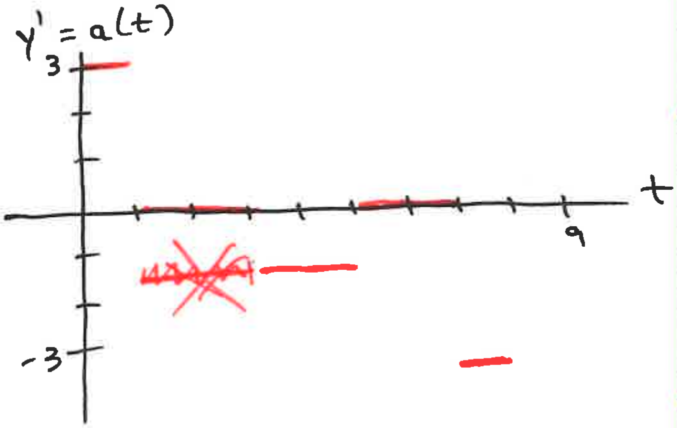
SLOWING DOWN ON $(0,1)$ AND $(2,3)$

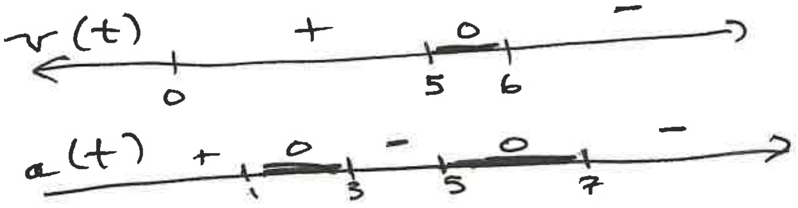


8. SPEEDING UP : $(0,1)$, $(7,8)$

SLOWING DOWN : $(3,5)$

CONSTANT SPEED : $(1,3)$, $(5,7)$





#26 189 – 91 : 3, 9, $\underline{10}$, $\underline{12}$

10. $x^2 + y^2 + z^2 = 9$, $\frac{dx}{dt} = 5$, $\frac{dy}{dt} = 4$, $\frac{dz}{dt} = ?$

(2, 2, 1)

$$\frac{d}{dt}\left[x^2 + y^2 + z^2\right] = \frac{d}{dt}[9]$$

$$2x\frac{dx}{dt} + 2y\frac{dy}{dt} + 2z\frac{dz}{dt} = 0$$

$$x\frac{dx}{dt} + y\frac{dy}{dt} + z\frac{dz}{dt} = 0$$

$$(2)(5) + (2)(4) + 1\frac{dz}{dt} = 0$$

$$\boxed{\frac{dz}{dt} = -18}$$

12. $xy = 8$, $(4,2) \longrightarrow \frac{dy}{dt} = -3$, $\frac{dx}{dt} = ?$

$$\frac{d}{dt}[y] = \frac{d}{dt}\left[8x^{-1}\right]$$

$$\frac{dy}{dt} = -8x^{-2}\frac{dx}{dt}$$

$$-\frac{1}{8}x^2\frac{dy}{dt} = \frac{dx}{dt}$$

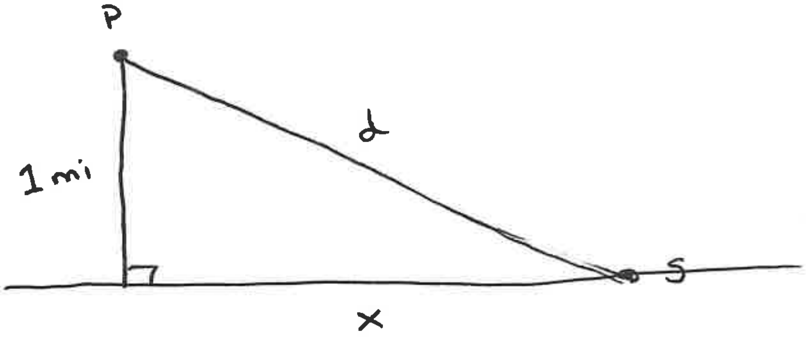
$$-\frac{1}{8}(16)(-3) = \frac{dx}{dt}$$

$$\boxed{6 \text{ cm/s} = \frac{dx}{dt}}$$

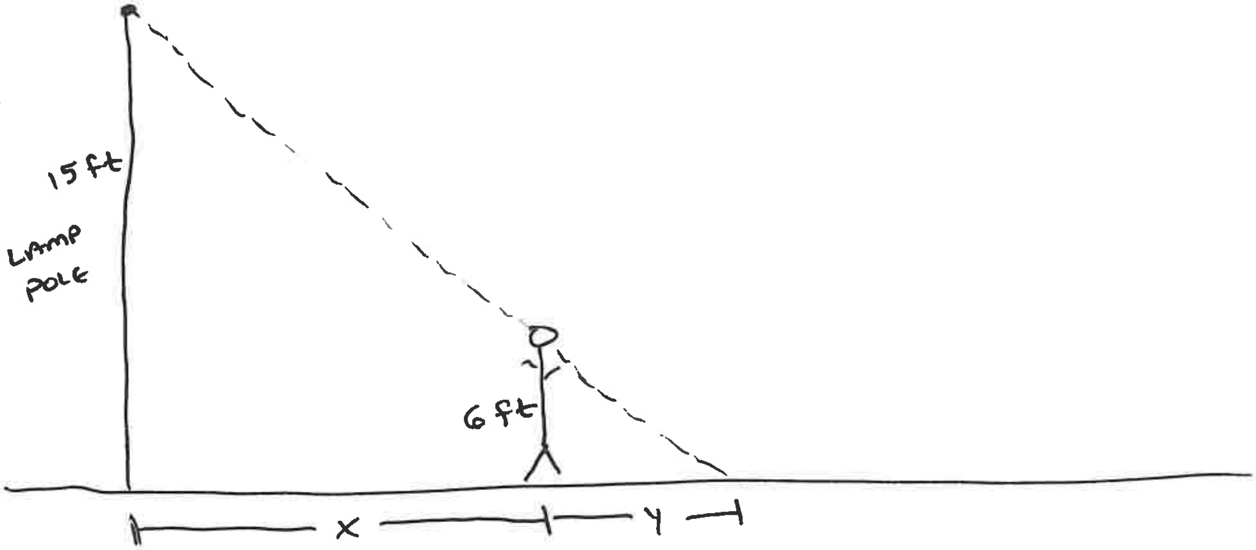
#27 p 189-91: 5, 7, 13, 15

13.

$1^2 + x^2 = d^2$

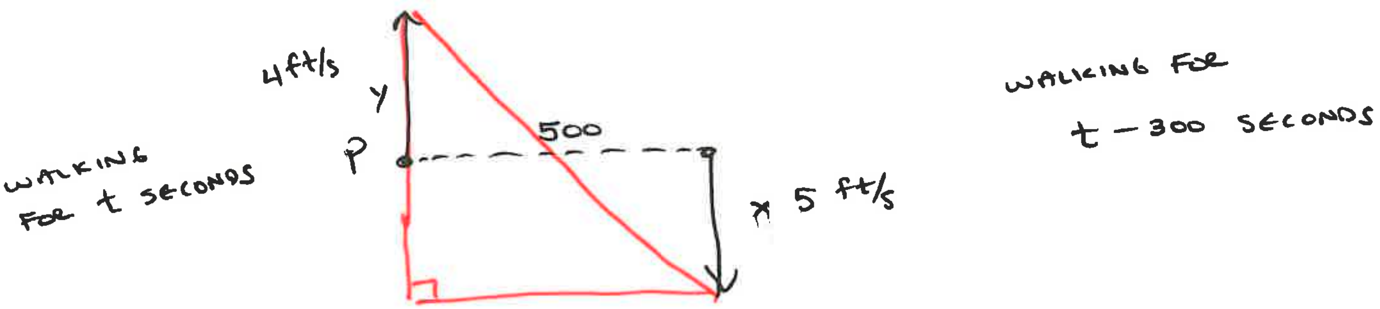


15.



#28 p 189-91: 19, 27, 35, 39.

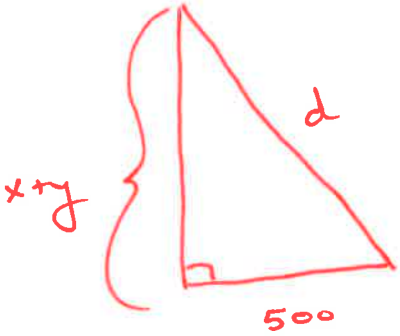
19.



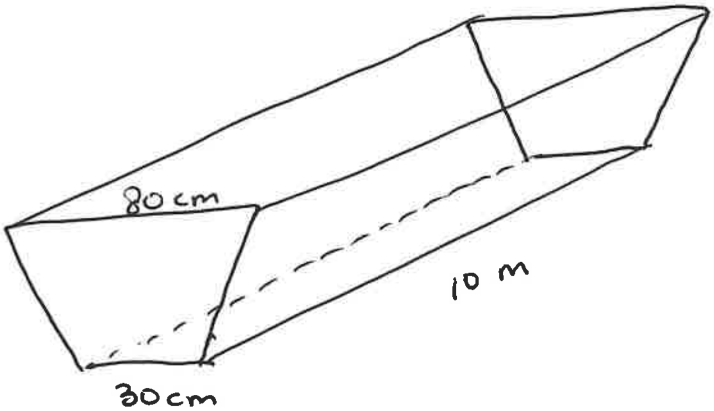
$$d = r \cdot t$$

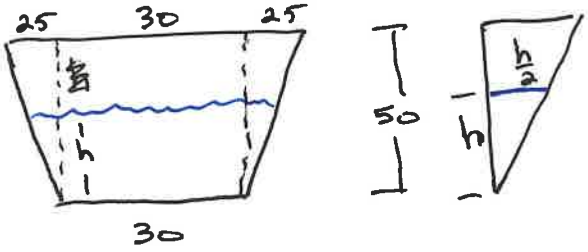
$$x = 5(t-300)$$

$$y = 4t$$



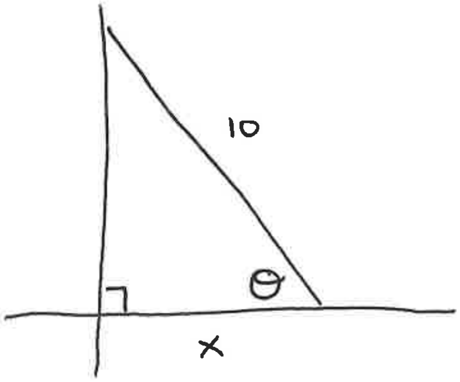
27.





$$V = \frac{1}{2}(h)(\underline{.30} + \underline{.30+h})\ 10$$

35.



$\cos\theta = \frac{x}{10}$

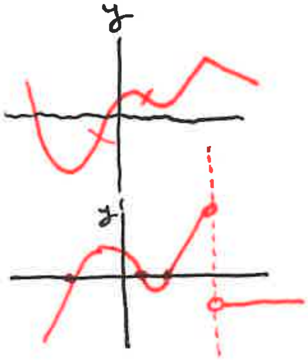
39. $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} \longrightarrow R^{-1} = R_1^{-1} + R_2^{-1}$

#29 p 196-97: 1, 3, 7, 9, 15, 19, 21

#30 p 200: T/F 1-6, p 200-03: EX: 3-7, 13-39 (ooo), 47, 51, 86, 87, 88

2. T 4. T 6. T

4.



6. $f(x) = x^6$

$a = 2$

86. $f(x) = x^{17}$ $a = 1$

$f'(x) = 17x^{16}$

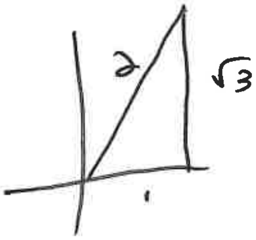
$f'(1) = 17$

88. $f(x) = \cos x$, $a = \frac{\pi}{3}$

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

$f'(\frac{\pi}{3}) = -\sin(\pi/3)$

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



#31 p 216-217: 3, 5, 6, 15-25 (ODD), 29-45 (ODD), 49-55 (ODD)

6. ABS. MAX: NONE

ABS. MIN: 1

LOCAL MAX: (3,4), (6,3)

LOCAL MIN: (4,1)

(2,2) IS ALSO A LOCAL MIN BY DEFN... (BUT THIS DOES NOT APPLY TO WHAT WE WILL BE USING IN A CALCULUS SENSE.)

#32 p 234: 1, 2, 5, 6, 9, 11, 13

2. a. (0,1) ∪ (3,7)
   b. (1,3)
   c. (2,4) ∪ (5,7)
   d. (0,2) ∪ (4,5)
   e. (2,2), (4,3), (5,4)

6. a. INC: (1,4) ∪ (5,6)
   DEC: (0,1) ∪ (4,5)

b. LOCAL MAX: X = 4
   LOCAL MIN: X = 1, 5

#33 p 234: 15-23 (ODD)

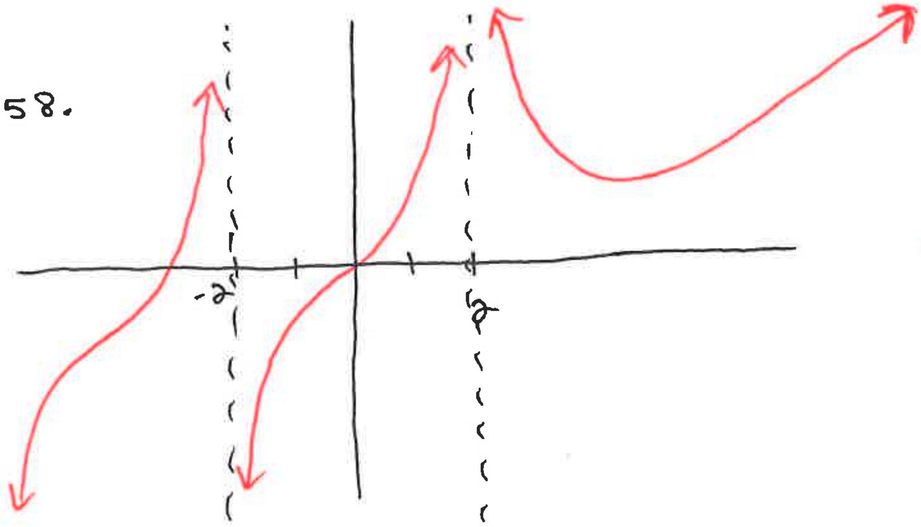
#34 3, 4, 5, 6, 9-25 (ODD)

4.
a. 2
b. -1
c. 0
d. about .35
e. about .35
f. x=1, x=3, y=2, y=-2

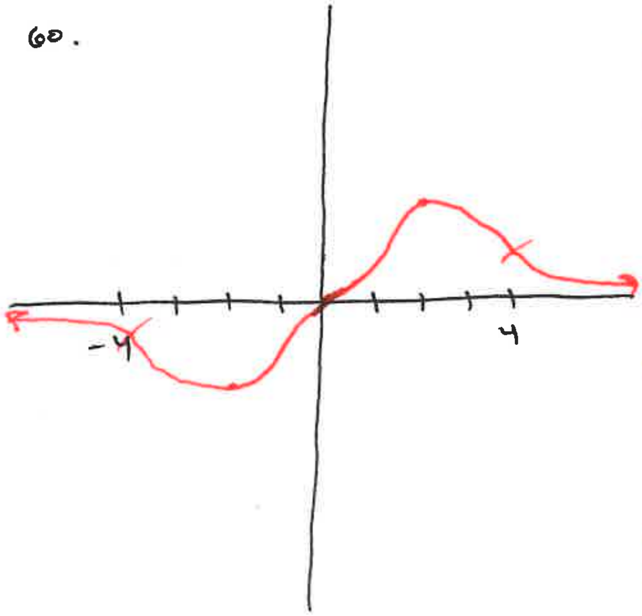
6. $\lim_{x \to \infty} \left(1 - \frac{2}{x}\right)^x \approx .13$

$\boxed{\#35}$ p 249: 57, 58, 59, 60

58.



60.



$\boxed{\#36}$ p 270-71: 1-8 all

2. $x - y = 100$ $\quad P = xy$

$P = x(x - 100)$

$P = x^2 - 100x$

$P' = 2x - 100$

$0 = 2x - 100$

$x = 50$

P' $\quad - \quad | \quad +$

50 min

$\boxed{(50, -50)}$

4. $x + y = 16$ $\quad S = x^2 + y^2$

$S = x^2 + (16 - x)^2$

$S = 2x^2 - 32x + 16^2$

$S' = 4x - 32$

$0 = 4x - 32$ $\quad x = 8$

S' $\quad - \quad | \quad +$

min 8

$\boxed{(8, 8)}$

6. $d = (x^2 + 1) - (x - x^2)$

$d = 2x^2 - x + 1$

$d' = 4x - 1$

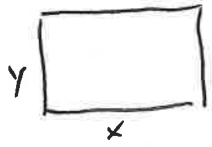
$0 = 4x - 1$ $\quad x = \frac{1}{4}$

d' $\quad - \quad | \quad +$

min $\frac{1}{4}$

$\boxed{d = \frac{7}{8}}$ minimum

8.



$x \cdot y = 1000$

$\boxed{\sqrt{1000} \times \sqrt{1000}}$ meters

$P = 2x + 2y$

$P = 2x + 2\left(\frac{1000}{x}\right)$

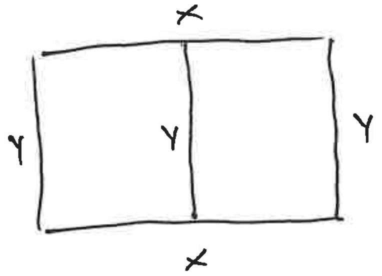
$P = 2x + 2000x^{-1}$

$P' = 2 - 2000x^{-2}$

$0 = 2 - \frac{2000}{x^2}$ $\quad x = \sqrt{1000}$

#37 & #38 p 270-71: 13, 15, 21, 33, 56

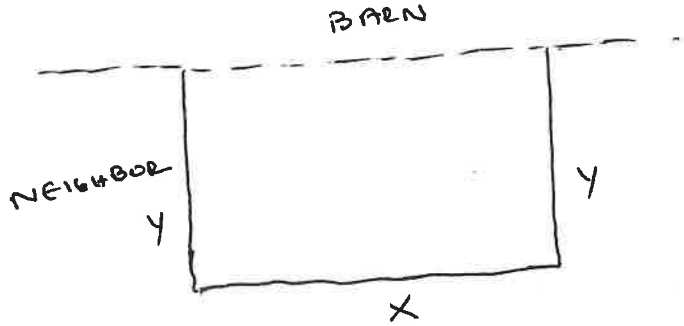
13.



$x \cdot y = 1{,}500{,}000$

$l = 2x + 3y$

15.



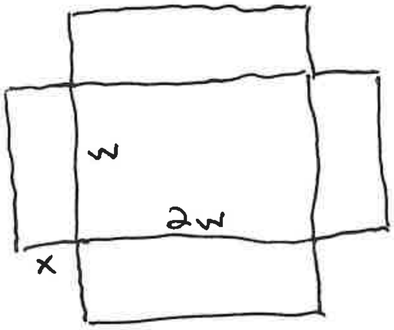
$l = x + y + y$

$c = 20(x+y) + 10y$

$5000 = 20x + 30y$

$A = x \cdot y$

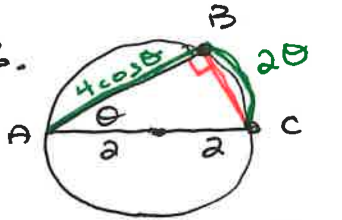
21.



$10 = 2w^2 x$

$c = 10(2w^2) + 6(6wx)$

56.



$d = r \cdot t$

$t = \frac{d}{r}$

ALL ROW: $t = \frac{4 \text{ mi}}{2 \text{ mph}} = 2$ HRS

ALL WALK: $t = \frac{2\pi \text{ mi}}{4 \text{ mph}} = \frac{\pi}{2}$ HRS

ROW THEN WALK COMBO:

$t = \frac{4\cos\theta}{2} + \frac{2\theta}{4}$

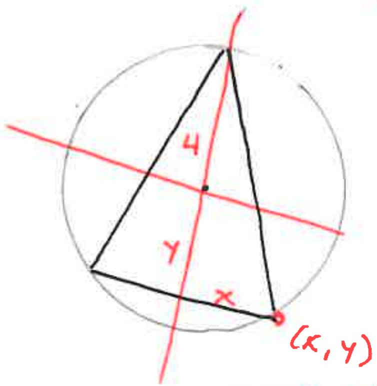
$= 2\cos\theta + \frac{\theta}{2}$

MIN OCCURS WHEN $\theta = \frac{\pi}{2}$

★ ALL WALK ★

33.

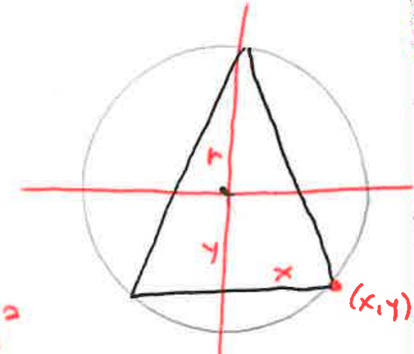
START HERE
$r = 4$



$x^2 + y^2 = 4^2$

$y = \sqrt{16 - x^2}$

NEXT
$r = r$



$x^2 + y^2 = r^2$

$y = \sqrt{r^2 - x^2}$

$A = x(4 + y)$

$A = x(4 + \sqrt{16 - x^2})$

$A' =$

MAX WHEN $x = 2\sqrt{3}$

$A(2\sqrt{3}) = 12\sqrt{3}$

$A = x(r + y)$

$A = x(r + \sqrt{r^2 - x^2}$

$A' =$

MAX WHEN $x = \frac{\sqrt{3}r}{2}$

$A\left(\frac{\sqrt{3}r}{2}\right) = \frac{3\sqrt{3}r^2}{4}$

#39 p 293-94 : 2-5, 8, 16, 38, 40

2. $f(x) = x(1-x)^{1/2} \longrightarrow$ DOMAIN $1-x \geq 0$, so $x \leq 1$

FOR THIS QUEST. $[-1, 1]$

$f'(x) = x \cdot \frac{1}{2}(1-x)^{-1/2}(-1) + (1-x)^{1/2}(1)$

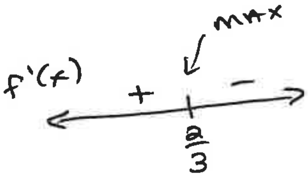
$= -\frac{x}{2}(1-x)^{-1/2} + (1-x)^{1/2}$

$= (1-x)^{-1/2}\left[\frac{-x}{2} + (1-x)\right]$

$= \dfrac{1-\frac{3}{2}x}{\sqrt{1-x}}$

$\longrightarrow$ CRITICAL VALUE $x = \frac{2}{3}$ $f'(x) = 0$

$\longrightarrow$ CRITICAL VALUE $x = 1$ $f'(x)$ UNDEFINED, YET IN DOMAIN



END PT. $f(-1) = -\sqrt{2}$

CRIT VALUE $f\left(\frac{2}{3}\right) = \frac{2}{3}\sqrt{\frac{1}{3}}$

$f(1) = 0$

END PT & CRIT VAL

LOCAL MAX AT $\left(\frac{2}{3}, \frac{2}{3}\sqrt{\frac{1}{3}}\right)$

ABS. MAX VALUE IS $\frac{2}{3}\sqrt{\frac{1}{3}}$

ABS. MIN VALUE IS $-\sqrt{2}$

4. $f(x) = \sqrt{x^2+x+1} = (x^2+x+1)^{1/2} \longrightarrow$ DOMAIN : $\mathbb{R}$

FOR THIS QUESTION $[-2, 1]$

$f'(x) = \frac{1}{2}(x^2+x+1)^{-1/2} \cdot (2x+1)$

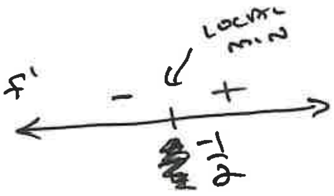
$= \dfrac{2x+1}{2\sqrt{x^2+x+1}}$ $\longrightarrow x = \frac{-1}{2}$

NO ZEROS IN DENOM.

$f(-2) = \sqrt{3}$

$f\left(\frac{-1}{2}\right) = \frac{3}{4}$

$f(1) = \sqrt{3}$



LOCAL MIN AT $\left(\frac{-1}{2}, \frac{3}{4}\right)$

ABS. MAX VALUE IS $\sqrt{3}$

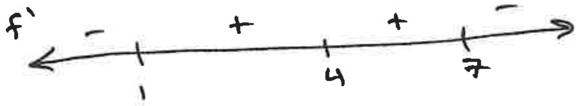
ABS. MIN VALUE IS $\frac{3}{4}$

8. $\lim\limits_{t \to \infty} \dfrac{t^3 - t + 2}{(2t-1)(t^2+t+1)} = \dfrac{1}{2}$

16. a. INC: $(1,4) \cup (4,7)$

DEC: $(0,1) \cup (7,8)$

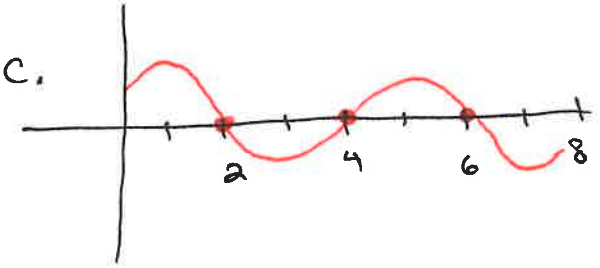
b.



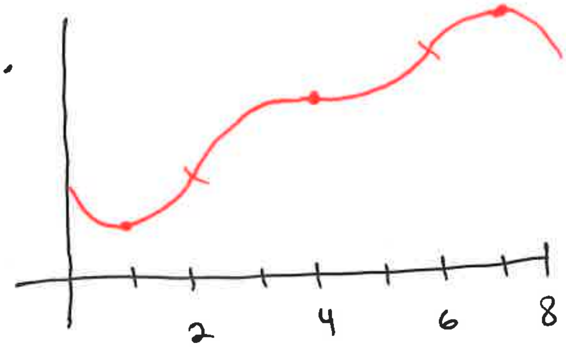
LOCAL MAX AT $x = 7$

LOCAL MIN AT $x = 1$

c.



d.



38. LET x = FIRST #

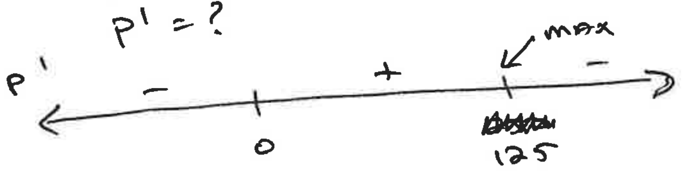
LET y = SECOND #

$x + 4y = 1000$

$P = x \cdot y$

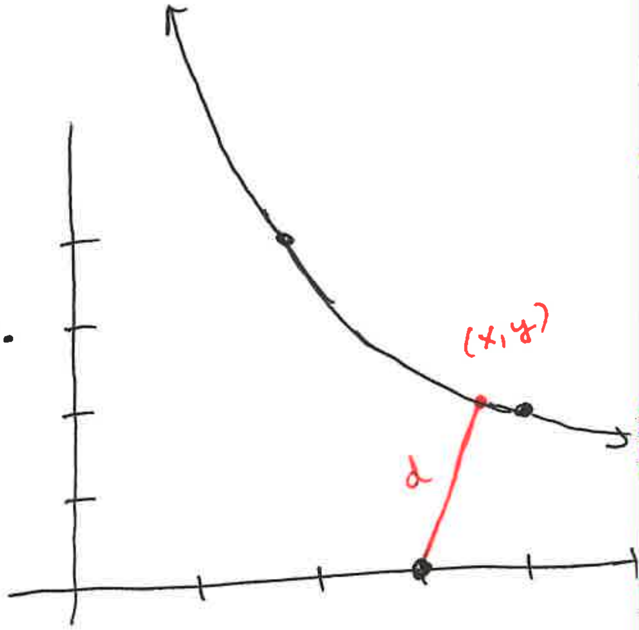
$P = (1000 - 4y) \cdot y$

$P' = ?$



$(500, 125)$

40.



TAKE THIS ON AS A CHALLENGE. THERE ARE MOSTLY LIKELY MORE METHODS THAN THE 3 THAT I'm THINKING OF RIGHT NOW.

#40 p 272: 29, 31, 37

TREAT THESE SIMILAR TO MY RECOMMENDATION ON ASSIGNMENT #37: 33 ...

INSTEAD OF USING THE SYMBOL FOR EACH CONSTANT, USE A SPECIFIC CONSTANT.

IN MY EXAMPLE, I FIRST USED $r = 4$ INSTEAD OF JUST r.

#41 p 290: 5–17 (ODD), 19–23 (ALL)

20. $f(t) = 3\cos t - 4\sin t$

$F(t) = 3\sin t + 4\cos t$

$F'(t) = 3\cos t - 4\sin t$ ✓

22. $h(x) = \sec^2 x + \pi\cos x$

$H(x) = \tan x + \pi\sin x$

$H'(x) = \sec^2 x + \pi\cos x$ ✓

#42 p 290–91: 27–37 (ODD), 49–52 (ALL)

50. $f'(x) = x^3$

$x + y = 0$

OR

$y = -x$

SLOPE $= -1$

WHERE IS $f'(x) = -1$?

ANTI DERIVATIVE $f(x) = \frac{1}{4}x^4$

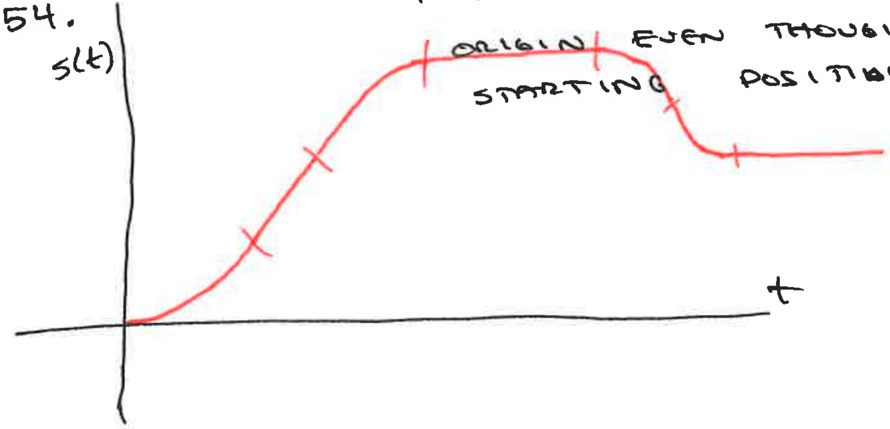
(DOES THIS FXN HAVE A SLOPE OF -1 AT SAME LOCATION?)

52. DON'T ANSWER C. TO THIS ONE. C WOULD BE THE DERIVATIVE. HAVE TO THINK IN REVERSE NOW.

#43 p 290-91: 39-47 (ooo), 53, 54

54.

I AM ASSUMING THE PARTICLE BEGINS AT THE ORIGIN EVEN THOUGH DIRECTION DON'T MENTION STARTING POSITION.



#44 p 311-12: 1, 3, 5, 9

#45 p 312: 11, 13, 14

14. DIFFERENT METHODS USING DIFFERENT GEOMETRIC SHAPES.

(PAY ATTENTION TO THE UNITS. THIS IS THE TRICKIEST PART.)

THE METHOD I USED TOTALLED ABOUT 7.24 km.

SUGGESTED STUDIES

p. 201 - 202 : 13-42, 47-50, 59-68, 73, 77, 80, 82, 84, 86 - 88

14. $y = x^{-1/2} - x^{-3/5}$

$y' = \frac{-1}{2} x^{-3/2} + \frac{3}{5} x^{-8/5}$

16. $y = \frac{\tan x}{(1+\cos x)}$

$y' = \frac{(1+\cos x) \cdot \sec^2 x - \tan x (-\sin x)}{(1+\cos x)^2}$

18. $y = (x + x^{-2})^{\sqrt{7}}$

$y' = \sqrt{7} (x + x^{-2})^{\sqrt{7} - 1} \cdot (1 - 2x^{-3})$

20. $y = \sin(\cos x)$

$y' = \cos(\cos x) \cdot (-\sin x)$

22. $y = \frac{1}{\sin(x - \sin x)}$

$y' = \frac{\sin(x - \sin x) \cdot 0 - 1 [\cos(x - \sin x) \cdot (1 - \cos x)]}{[\sin(x - \sin x)]^2}$

24. $y = \sec(1 + x^2)$

$y' = \sec(1+x^2) \cdot \tan(1+x^2) \cdot (2x)$

26. $y + x \cos y = x^2 y$

$$\frac{dy}{dx} + x\left(-\sin y \frac{dy}{dx}\right) + \cos y = x^2 \frac{dy}{dx} + y(2x)$$

$$\frac{dy}{dx} - x \sin y \frac{dy}{dx} - x^2 \frac{dy}{dx} = 2xy - \cos y$$

$$\frac{dy}{dx}\left[1 - x \sin y - x^2\right] = 2xy - \cos y$$

$$\frac{dy}{dx} = \frac{2xy - \cos y}{1 - x\sin y - x^2}$$

28. $y = \left(x + x^{1/2}\right)^{1/3}$

$$y' = \frac{1}{3}\left(x + x^{1/2}\right)^{-2/3}\left(1 + \frac{1}{2}x^{-1/2}\right)$$

30. $y = \left[\sin\left(x^{1/2}\right)\right]^{1/2}$

$$y' = \frac{1}{2}\left[\sin(x^{1/2}\right]^{-1/2} \cdot \cos\left(x^{1/2}\right) \cdot \frac{1}{2}x^{-1/2}$$

32. $y = \dfrac{(x+\lambda)^4}{x^4+\lambda^4}$

$$y' = \frac{(x^4+\lambda^4)\cdot 4(x+\lambda)^3 \cdot 1 - (x+\lambda)^4 \cdot 4x^3}{(x^4+\lambda^4)^2}$$

34. $y = \dfrac{\sin(mx)}{x}$

$$y' = \frac{x \cdot \cos(mx) \cdot m - \sin(mx) \cdot 1}{x^2}$$

36. $x \cdot \tan y = y - 1$

$$x \cdot \sec^2 y \frac{dy}{dx} + \tan y = \frac{dy}{dx}$$

$$x \cdot \sec^2 y \frac{dy}{dx} - \frac{dy}{dx} = -\tan y$$

$$\frac{dy}{dx}\left[x \cdot \sec^2 y - 1\right] = -\tan y$$

$$\frac{dy}{dx} = \frac{-\tan y}{x \cdot \sec^2 y - 1}$$

38. $y = \dfrac{x^2 - 5x + 4}{x^2 - 5x + 6}$

$$y' = \frac{(x^2 - 5x + 6)(2x - 5) - (x^2 - 5x + 4)(2x - 5)}{(x^2 - 5x + 6)^2}$$

40. $y = \left[\sin(\cos(\sin \pi x)^{1/2})\right]^2$

6 LINKS
B.C. 6 FXNS COMPOSED OF

$$y' = 2\left[\sin(\cos(\sin \pi x)^{1/2})\right]^1 \cdot \cos(\cos(\sin \pi x)^{1/2}) \cdot -\sin(\sin \pi x)^{1/2}) \cdot \frac{1}{2}(\sin \pi x)^{-1/2} \cdot \cos(\pi x) \cdot \pi$$

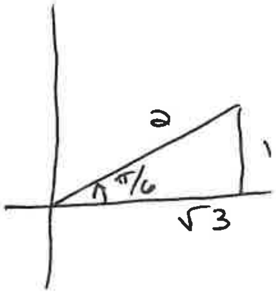
42. $g(\theta) = \theta \cdot \sin\theta$

$g'(\theta) = \theta \cdot \cos\theta + \sin\theta$

$g''(\theta) = \theta(-\sin\theta) + \cos\theta + \cos\theta$

$= -\theta\sin\theta + 2\cos\theta$

$g''(\frac{\pi}{6}) = -\frac{\pi}{6}(\frac{1}{2}) + 2(\frac{\sqrt{3}}{2})$



48. $y = \frac{x^2-1}{x^2+1}$; $(0,-1)$

$y' = \frac{(x^2+1)(2x) - (x^2-1)(2x)}{(x^2+1)^2}$

$y'(0) = \frac{0-0}{1} = 0$

$y+1 = 0(x-0)$

$y = -1$

50. $x^2 + 4xy + y^2 = 13$; $(2,1)$

$2x + 4x\frac{dy}{dx} + y(4) + 2y\frac{dy}{dx} = 0$

$4x\frac{dy}{dx} + 2y\frac{dy}{dx} = -2x - 4y$

$\frac{dy}{dx}(4x+2y) = -2x-4y$

$\frac{dy}{dx} = \frac{-2x-4y}{4x+2y} = \frac{-x-2y}{2x+y}$

$\left.\frac{dy}{dx}\right|_{(2,1)} = \frac{-2-2}{4+1} = \frac{-4}{5}$

TANGENT LINE

$y - 1 = -\frac{4}{5}(x-2)$

$y - 1 = \frac{5}{4}(x-2)$

NORMAL LINE

$\perp$

60. a. $P(x) = f(x) \cdot g(x)$

$$P'(x) = f(x) \cdot g'(x) + g(x) \cdot f'(x)$$

$$P'(2) = f(2) \cdot g'(2) + g(2) \cdot f'(2)$$

$$= (1)(2) + (4)(-1) = -2$$

b. $Q(x) = \frac{f(x)}{g(x)}$

$$Q'(x) = \frac{g(x) \cdot f'(x) - f(x) \cdot g'(x)}{[g(x)]^2}$$

$$Q'(2) = \frac{(4)(-1) - (1)(2)}{4^2} = \frac{-6}{16}$$

c. $C(x) = f(g(x))$

$$C'(x) = f'(g(x)) \cdot g'(x)$$

$$C'(2) = f'(4) \cdot (2)$$

$$= (3)(2) = 6$$

62. $f(x) = g(x^2)$

$$f'(x) = g'(x^2) \cdot 2x$$

64. $f(x) = x^a \cdot g(x^b)$

$$f'(x) = x^a \cdot g'(x^b) \cdot b x^{b-1} + g(x^b) \cdot a x^{a-1}$$

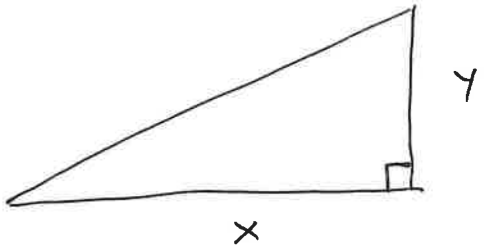
66. $f(x) = \sin(g(x))$

$$f'(x) = \cos(g(x)) \cdot g'(x)$$

68. $f(x) = g(\tan(x^{1/2}))$

$$f'(x) = g'(\tan(x^{1/2})) \cdot \sec^2(x^{1/2}) \cdot \frac{1}{2} x^{-1/2}$$

80.



$x = \frac{15}{4}(y)$

$\frac{dx}{dt} = \frac{15}{4}\frac{dy}{dt}$

$30 = \frac{15}{4}\frac{dy}{dt}$

$\frac{dy}{dt} = 8$ ft/s

82. $f(x) = \sqrt{25-x^2}$ $x = 3$

a. $f(3) = 4$ $(3,4)$

$f'(x) = \frac{1}{2}(25-x^2)^{-1/2}(-2x)$

$f'(3) = \frac{-2(3)}{2\sqrt{25-9}} = \frac{-3}{4}$

$y - 4 = \frac{-3}{4}(x-3)$

$y = 4 - \frac{3}{4}(x-3)$

b. USE GRAPHING UTILITY TO VIEW THIS RELATIONSHIP.

c. USE A TABLE TO COMPARE FXNS

THE ERROR BETWEEN THE TWO SHOULD BE LESS THAN $\frac{1}{10}$ ... SO SOMETHING LIKE THIS

$$\left| \overset{\substack{\text{ACTUAL FXN}\\ \downarrow}}{f(x)} - \overset{\substack{\text{TANGENT LINE}\\ \swarrow}}{L(x)} \right| < \frac{1}{10}$$

84. $y = x^3 - 2x^2 + 1$; $x = 2$, $dx = .2$

$\frac{dy}{dx} = 3x^2 - 4x$ $\qquad dy = (3x^2 - 4x)dx$

$dy = (\ \ 4\ \ )(.2) = .8$

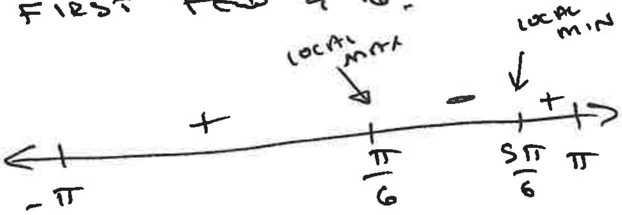
86-88 THESE ARE LIMIT DEFN. OF DERIVATIVE QUESTIONS

86. 17 $\qquad$ 88. $-\frac{\sqrt{3}}{2}$

SUGGESTED STUDIES

p 293-94 : 1-6, 16, 29-32, 36

SEE ASSIGNMENT #39 FOR THE FIRST FEW & 16.

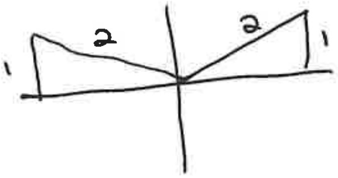


6. $f(x) = x + 2\cos x$, $[-\pi, \pi]$

$f'(x) = 1 - 2\sin x$

$0 = 1 - 2\sin x$

$\sin x = \frac{1}{2}$ $\quad x = \frac{\pi}{6}, \frac{5\pi}{6}$



$f(-\pi) = -\pi - 2 \approx -5$

$f(\frac{\pi}{6}) = \frac{\pi}{6} + \sqrt{3} \approx 2.2$

$f(\frac{5\pi}{6}) = \frac{5\pi}{6} - \sqrt{3} \approx .8$

$f(\pi) = \pi - 2 \approx 1$

LOCAL MAX AT $(\frac{\pi}{6}, \frac{\pi}{6} + \sqrt{3})$ $\quad$ ALSO ABS. MAX. $\frac{\pi}{6} + \sqrt{3}$

LOCAL MIN AT $(\frac{5\pi}{6}, \frac{5\pi}{6} - \sqrt{3})$

ABS MIN. VAL. $-\pi - 2$

30 & 32 WILL TAKE SOME TIME TO DIG INTO, BUT IT WILL BE HELPFUL TO SEE THE INTERACTION BTWN f, f', & f''. I USE GEOGEBRA.ORG.

30. $f(x) = \dfrac{x^3+1}{x^6+1}$

$$f'(x) = \frac{(x^6+1)(3x^2) - (x^3+1)(6x^5)}{(x^6+1)^2}$$

$$= \frac{-3x^8 - 6x^5 + 3x^2}{(x^6+1)^2}$$

ZEROS ARE IN HERE

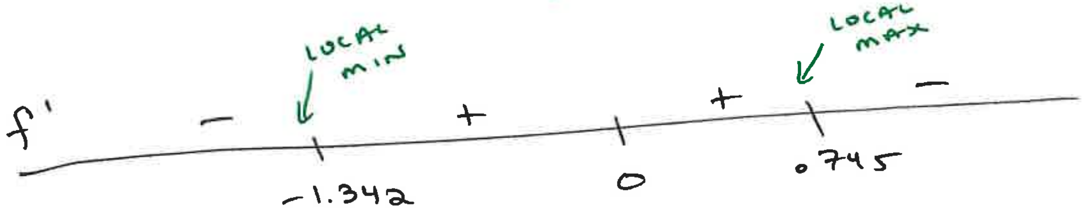
DENOM. WILL HAVE NO INFLUENCE ON ZEROS, IT IS ALWAYS +.

ZERO'S IN HERE

$$f''(x) = \frac{(x^6+1)^2(-24x^7 - 30x^4 + 6x) - (-3x^8 - 6x^5 + 3x^2)\cdot 2(x^6+1)^2(6x^5}{(x^6+1)^4}$$

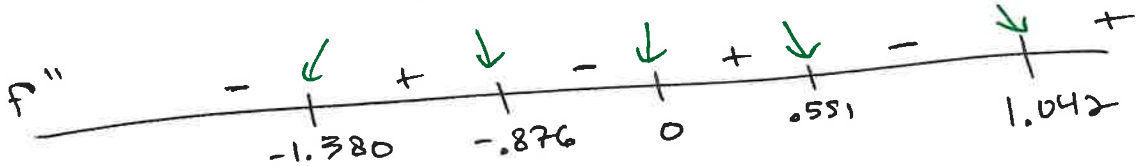
NO INFLUENCE ON SHAPE

$f(-1.342) \approx -.207$



$f(.745) \approx 1.207$

ALL ARE PTS OF INFLECTION



LOCAL MIN IS ALSO ABS. MIN & LOCAL MAX. IS ALSO ABS. MAX. (LOOK ON GRAPH OF f)

INCREASING: $(-1.342, 0) \cup (0, .745)$

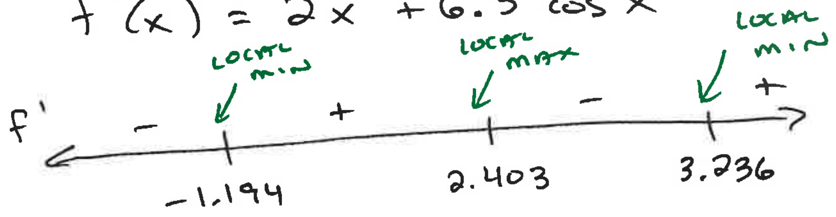
DECREASING: $(-\infty, -1.342) \cup (.745, \infty)$

CONCAVE UP: $(-1.380, -.876) \cup (0, .551) \cup (1.042, \infty)$

CONCAVE DOWN: $(-\infty, -1.380) \cup (-.876, 0) \cup (.551, 1.042)$

32. $f(x) = x^2 + 6.5 \sin x$; $[-5, 5]$

$f'(x) = 2x + 6.5 \cos x$



INCREASING:

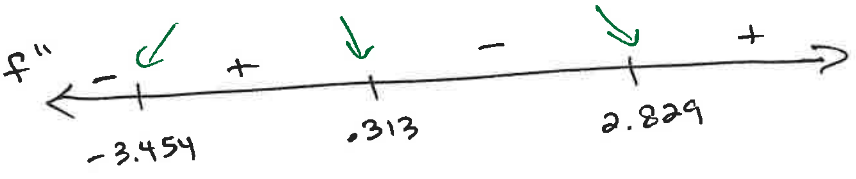
$(-1.194, 2.403) \cup (3.236, 5]$

DECREASING:

$[-5, -1.194) \cup (2.403, 3.236)$

$f''(x) = 2 - 6.5 \sin x$

ALL PTS OF INFL. BECAUSE OF SIGN CHANGE



CONCAVE UP:

$(-3.454, .313) \cup (2.829, 5]$

CONCAVE DOWN:

$[-5, -3.454) \cup (.313, 2.829)$

$f(-5) \approx \boxed{31.233}$ ← ABS MAX VALUE

$f(-1.194) \approx \boxed{-4.618}$ ← ABS MIN VALUE

$f(2.403) \approx 10.151$

$f(3.236) \approx 9.859$

$f(5) \approx 18.770$

36. $y = ax^3 + bx^2 \xrightarrow{\text{AT } (1,3)} 3 = a + b$

$y' = 3ax^2 + 2bx$

$y'' = 6ax + 2b$ (POINT OF INF. FOUND HERE.)

$0 = 6a(1) + 2b$

$3 = a + b$

$0 = 6a + 2b$

$a = -\frac{3}{2}, \; b = \frac{9}{2}$