alleem AlAli

Quiz I: MTH 111, Spring 2018

Ayman Badawi

$\frac{(y^2-y_0)^2}{10} + \frac{(x-x_0)^2}{1}$

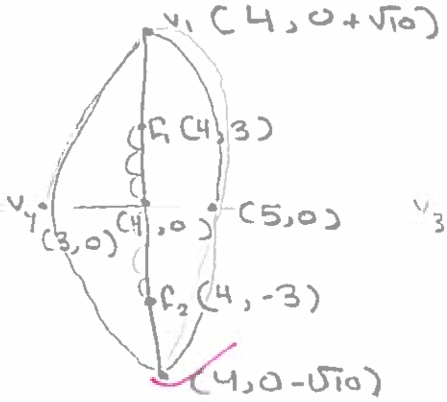
15/15

QUESTION 1. Consider the ellipse given by $\frac{y^2}{10} + (x-4)^2 = 1$

$c = (4, 0)$

(i) Sketch, roughly.

$b^2 = 1 \quad b = 1$



(ii) Find the ellipse-constant K. $\sqrt{\left(\frac{K}{2}\right)^2} = \sqrt{10}$ $\boxed{K/2 = \sqrt{10}}$

$K = 2\sqrt{10}$

(iii) Find the foci. $|CF_1| = \sqrt{(K/2)^2 - b^2} = \sqrt{10-1} = 3$

5 $F_1\ (4, 3)$ $F_2 = (4, -3)$

(iv) Find all vertices. $V_1 = (4, 0+\sqrt{10})$ $V_3 = (4+1, 0)$

$V_2 = (4, 0-\sqrt{10})$ $V_4 = (4-1, 0)$

QUESTION 2. Consider the parabola $y = 3x^2 + 18x + 5$

(i) Sketch, roughly. Standard form

5

$y = 3[x^2 + 6x] + 5$

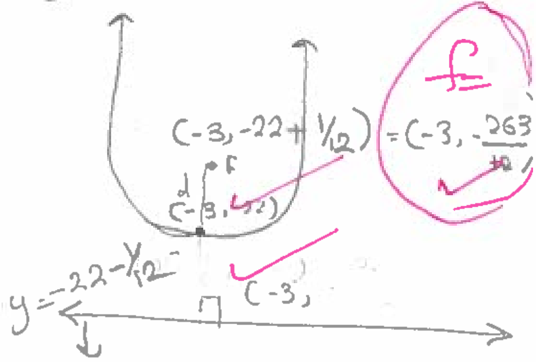
$y = 3[(x+3)^2 - 9] + 5$

$y = 3(x+3)^2 - 27 + 5$

$y = 3(x+3)^2 - 22$

$y + 22 = 3(x+3)^2$

$\frac{1}{3}(y+22) = (x+3)^2$



$= (-3, -\frac{263}{12})$ F

(ii) Find the focus.

write answers here!

vertex $= (-3, -22)$

$(-3,$

$4d = \frac{1}{3} \quad d = \frac{1}{3} \times \frac{1}{4} = \frac{1}{12}$

(iii) Find the directrix line.

$y = -\frac{265}{12}$

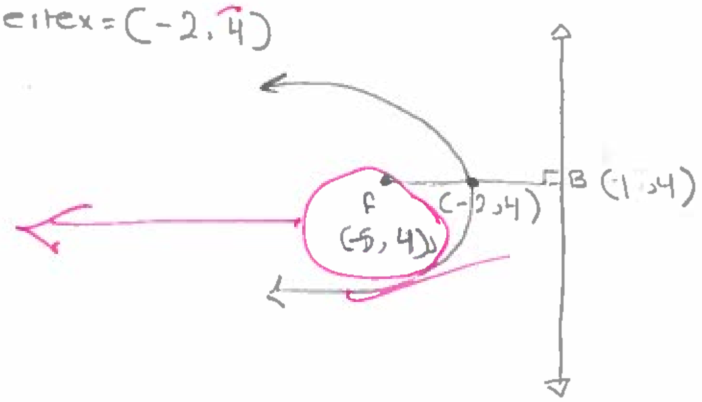
QUESTION 3. Consider the parabola $-12(x+2) = (y-4)^2$

vertex $= (-2, 4)$

(i) Sketch, roughly.

$4d = -12$

$\boxed{d = -3}$



(ii) Find the focus.

5 $(-5, 4)$

(iii) Find the directrix line. $x = 1$

Faculty information

Ayman Badawi, Department of Mathematics & Statistics, American University of Sharjah, P.O. Box 26666, Sharjah, United Arab Emirates.
E-mail: abadawi@aus.edu, www.ayman-badawi.com

$x = 1$

$(1, 4)$

$(-5, 4)$

Quiz I: MTH 111, Spring 2018

Ayman Badawi

15

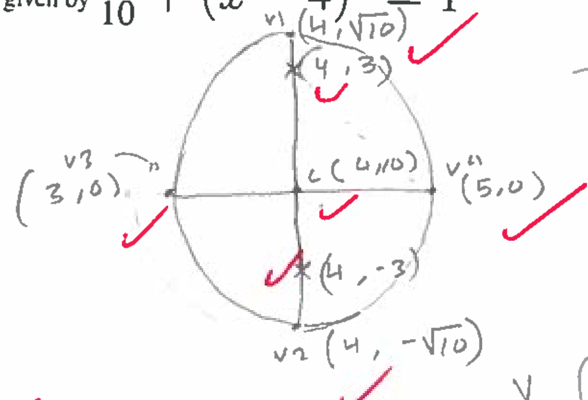
center $= (4, 0)$ (h, v)

$$\frac{(y-0)^2}{10} \quad \frac{(x-4)^2}{1} = 1$$

QUESTION 1. Consider the ellipse given by $\frac{y^2}{10} + (x-4)^2 = 1$

(i) Sketch, roughly.

N/N



$a^2 = 10$ $\quad b^2 = 1$ $\quad b = 1$

$\frac{K}{2} = \sqrt{}$ $\quad K = 2\sqrt{1}$

(ii) Find the ellipse-constant K.

$K = 2\sqrt{10}$

V $(h, v \pm a)$

cv $(h \pm b, v)$

$a^2 - b^2 = F^2$

$10 - 1 = F^2$

$9 = F^2$

$F = 3$

(iii) Find the foci.

$(4, 3)$ $\quad (4, -3)$

(iv) Find all vertices.

$(4, \sqrt{10}), (4, -\sqrt{10}), (5, 0), (3, 0)$

$F = (h, v \pm F)$

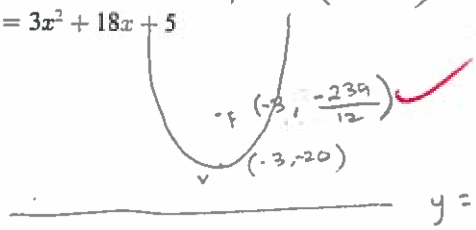
$(4, 0+3)$

$(4, 0-3)$

QUESTION 2. Consider the parabola $y = 3x^2 + 18x + 5$

(i) Sketch, roughly.

N/N



$y = \frac{-241}{12}$

$y = 3x^2 + 18x + 7$

$y = [3(x^2 + 6x)] + 7$

$y = [3(x+3)^2 - 9] + 7$

$y = 3(x+3)^2 - 27 + 7$

$y = 3(x+3)^2 - 20$

$\frac{1}{3}(y + 20) = \frac{3(x+3)^2}{3}$

$V = (-3, -20)$ $\quad \frac{1}{3}(y+20) = (x+3)^2$

$\frac{1}{3} = 4D$ $\quad D = \frac{1}{12}$

3/3

(ii) Find the focus.

$(-3, \frac{-284}{12})$

(iii) Find the directrix line.

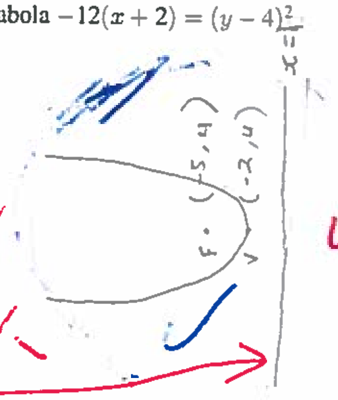
$y = \frac{-265}{12}$

QUESTION 3. Consider the parabola $-12(x+2) = (y-4)^2$

$v = (-2, 4)$

(i) Sketch, roughly.

N/N



(ii) Find the focus.

$(-5, 4)$ N/N

$4D = -12$

$D = -3$

5/5

(iii) Find the directrix line.

$x = 1$

Faculty information

Ayman Badawi, Department of Mathematics & Statistics, American University of Sharjah, P.O. Box 26666, Sharjah, United Arab Emirates.
E-mail: abadawi@aus.edu, www.ayman-badawi.com

-5 -4 -3 -2 -1 0 1

$(x+3)^2$

$(x+3)(x+3)$

$x^2 + 3x + 3x + 9 - 9$

Quiz II: MTH 111, Spring 2018

Ayman Badawi

$$\frac{(y-y_0)^2}{(\frac{k}{2})^2} - \frac{(x-x_0)^2}{b^2} = 1$$

$C(-1,2)$

QUESTION 1. Consider the hyperbola given by $\frac{(y-2)^2}{9} - \frac{(x+1)^2}{16} = 1$

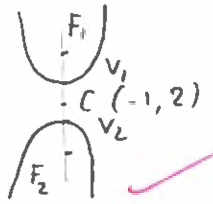
$\frac{15}{15}$

$(\frac{k}{2})^2 = 9 \Rightarrow \frac{k}{2} = 3$

$\Rightarrow k = 6$

$|CF_1| = \sqrt{16+9}$
$= 5$

(i) Sketch, roughly.



(ii) Find the ellipse-constant K.

$\boxed{k=6}$

(iii) Find the foci.

$F_1(-1, 2+5) \Rightarrow \boxed{F_1(-1,7)}$ $\quad F_2(-1, 2-5) \Rightarrow \boxed{F_2(-1,-3)}$

(iv) Find all vertices.

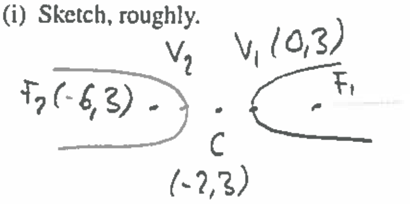
$V_1(-1, 2+3) \Rightarrow \boxed{V_1(-1,5)}$

$V_2(-1, 2-3) \Rightarrow \boxed{V_2(-1,-1)}$

QUESTION 2. Given a ~~parabola~~ hyperbola centered at $(-2,3)$ such that one of the vertices is $(0,3)$ and one of the foci is (-6, 3).

$$\frac{(x-x_0)^2}{(\frac{k}{2})^2} - \frac{(y-y_0)^2}{b^2} = 1$$

(i) Sketch, roughly.



$|CF_1| = \sqrt{(\frac{k}{2})^2 + b^2}$ $\quad |CF_1| = 4$

$b^2 = |CF_1|^2 - (\frac{k}{2})^2$

$b^2 = 4^2 - 4 \Rightarrow b^2 = 12$

(ii) Find the constant K.

$\frac{k}{2} = |C_1V_2| = 2 \Rightarrow \boxed{k=4}$

(iii) Find the second focus and the second vertex.

$\boxed{V_2(-4,3)}$

$\boxed{F_1(2,3)}$

(iv) Write down the equation of the hyperbola.

$$\frac{(x+2)^2}{4} - \frac{(y-3)^2}{12} = 1$$

Faculty information

Ayman Badawi, Department of Mathematics & Statistics, American University of Sharjah, P.O. Box 26666, Sharjah, United Arab Emirates.
E-mail: `abadawi@aus.edu`, `www.ayman-badawi.com`

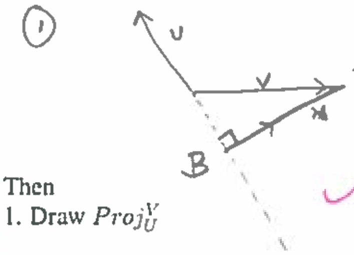
Quiz III: MTH 111, Spring 2018

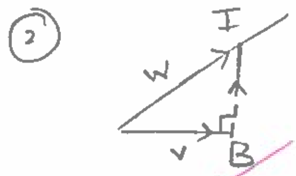
Ayman Badawi

Archa Alukka
75223

14.5/15

QUESTION 1. Stare at the following vectors.





Then
1. Draw $Proj_U^V$

Projections are IB

3

2. Draw $Proj_V^W$

QUESTION 2. Given $(1,2,4)$ and $(7,-4,3)$ lie on a line L.

a) Find a parametric equations of L.

$D = (7-1, -4-2, 3-4) = (6,-6,-1)$

$(1,2,4)$ and $(6,-6,-1)$

$(1+6L,\ 2-6L,\ 4-L)$

$X = 1+6L \quad Y = 2-6L \quad Z = 4-L$

3

b) Find a symmetric equations of L.

$6L = 2-Y$

$$L: \frac{X-1}{6} = \frac{2-Y}{6} = \frac{4-Z}{1}$$

c) Does the point $(1,4,8)$ lie on the line L.

- $\frac{X-1}{6} = \frac{1-1}{6} = 0$
- $\frac{4-8}{6} = \frac{-2}{6} = -\frac{1}{3}$
- $4-8 = -4$

∴ It doesn't lie on the line L because the values varies when substituted.

1

QUESTION 3. Let $V = <1,1,2>$ and $W = <-2,2,-1>$. Find $Proj_V^W$. Will it be in the direction of V?

$Proj_V W = \frac{U.W}{|V|^2} \times V$

$|V| = \sqrt{1^2+1^2+2^2} = \sqrt{1+1+4} = \sqrt{6}$

$|V|^2 = 6$

$U.W = 1(-2)+1(2)+2(-1)$
$= -2+2-2 = -2$

$Proj_V W = \frac{-2}{6} \times (1,1,2) = \left(\frac{-2}{6}, \frac{-2}{6}, \frac{-4}{6}\right)$

Yes, it will be in the direction of V

No

opposite

3.5

Faculty information

Ayman Badawi, Department of Mathematics & Statistics, American University of Sharjah, P.O. Box 26666, Sharjah, United Arab Emirates.
E-mail: abadawi@aus.edu, www.ayman-badawi.com

Name [illegible], ID [illegible]

Quiz 4 ~~HW 9~~: MTH 111, Spring 2018

Ayman Badawi

$\frac{15}{15}$

QUESTION 1. a) Find the equation of the plane that contains the points $Q_1 = (0,1,1), Q_2 = (0,2,3), Q_3 = (1,3,2)$.

$\overrightarrow{Q_1Q_2}$: $(0,2,3) - (0,1,1) \rightarrow \langle 0,1,2 \rangle$

$\overrightarrow{Q_1Q_3}$: $(1,3,2) - (0,1,1) \rightarrow \langle 1,2,1 \rangle$

$\overrightarrow{Q_1Q_2} \cdot \overrightarrow{Q_1Q_3} = \langle N \rangle = i[(1\times1)-(2\cdot2)] - j[(0\cdot1)-(2\cdot1)] + k[(0\cdot2)-(1\cdot1)]$

$$\begin{array}{ccc} i & j & k \\ 0 & 1 & 2 \\ 1 & 2 & 1 \end{array}$$

$-3i + 2j - k$

$\langle N \rangle$ $\langle -3, 2, -1 \rangle$

5

equation: $\boxed{-3x + 2(y-2) - 1(z-1) = 0}$

c) Given a plane $P: 5x - 7y + z = 21$ Can we draw the vector $V = \langle -4, -3, -1 \rangle$ inside the plane P? explain

3

$N \langle 5, -7, 1 \rangle$ $N \cdot V = 0 = \perp \longrightarrow$ so inside plane

$V \langle -4, -3, -1 \rangle$ $(5\cdot -4) + (-7\cdot -3) + (1\cdot -1) = -20 + 21 - 1 = 0$

yes this vector is inside the plane as $V \cdot D = 0$ so $\perp$

d) Find the distance between the point (0, -10, 5) and the plane $P: x - 2y + 2z = 21$

$\frac{|W \cdot D|}{|D|} =$ ① $x - 2y + 2z - 21 = 0$ ② $\langle 1, -2, 2 \rangle$

3

$\frac{|0 - 2(-10) + 2(5) - 21|}{\sqrt{1^2 + (-2)^2 + 2^2}} = \frac{9}{3} = \boxed{3 \text{ units}}$

QUESTION 2. Given $L_1: x = t + 1, y = t + 2, z = t + 3$ and $L_2: x = 2w - 1, y = 2w + 3, z = 2w - 1$ are parallel (do not show that). Find the distance between L_1 and L_2 (i.e., find $|L_1 L_2|$).

L_1: $x = t+1$
$y = t+2$
$z = t+3$

Q_4: when $t = 0$

$\boxed{(1, 2, 3)}$

L_2: $x = 2w-1$
$y = 2w+3$
$z = 2w-1$

I: when $w = 0$

$\boxed{(-1, 3, -1)}$

$\boxed{d: \langle 2, 2, 2 \rangle}$

V: $I - Q$

$\langle -2, 1, -4 \rangle$

$\frac{|V \cdot d|}{|d|}$

$$\begin{array}{ccc} i & j & k \\ -2 & 1 & -4 \\ 2 & 2 & 2 \end{array}$$

$i[(1\cdot2) - (-4\cdot2)] - j[(-2\cdot2)-(-4\cdot2)] + k[(-2\cdot2)-(2\cdot1)]$

$\langle 10i - 4j - 6k \rangle$

$\langle 10, -4, 6 \rangle$

4

. Faculty information

Ayman Badawi, Department of Mathematics & Statistics, American University of Sharjah, P.O. Box 26666, Sharjah, United Arab Emirates.
E-mail: abadawi@aus.edu, www.ayman-badawi.com

$\frac{|\sqrt{10^2 + (-4)^2 + (6)^2}|}{\sqrt{2^2 + 2^2 + 2^2}}$

$= \boxed{\frac{2\sqrt{38}}{2\sqrt{3}} \text{ units}}$

Name NADIN ELSHIRBINI , ID 12459

Quiz 5: MTH 111, Spring 2018

Ayman Badawi

$\frac{15}{15}$

QUESTION 1. a) The Plane $P: 2x + y - z = 16$ intersects the line $L: x = 3t, y = -2t + 4, z = -t - 2$ at a point Q find Q.

$2(3t) - 2t + 4 + t + 2 = 16$

$6t - 2t + 4 + t + 2 = 16$

$t = 2$ 1/1

$\boxed{Q(6,0,-4)}$ ✓ 1/1

4/4

$x = 3(2) = 6$

$y = -2(2) + 4 = 0$

$z = -2 - 2 = -4$

c) The two planes $P_1: 2x + y - z = 6$ and $P_2: 4x - y + z = 12$ intersect in a line L. Find a parametric equations of L.

$N_1: <2,1,-1>$, $N_2 <4,-1,1>$

$D = N_1 \times N_2 = \begin{vmatrix} i & j & k \\ 2 & 1 & -1 \\ 4 & -1 & 1 \end{vmatrix} = <0,-6,-6>$ 1/1

$\boxed{L: \begin{cases} x = 3 \\ y = -6t \\ z = -6t \end{cases} ; t \in \mathbb{R}}$ ✓

take $z = 0$

$2x + y = 6$

$4x - y = 12$

$x = 3 \quad y = 0$

$\Rightarrow Q(3,0,0)$ 1/1

4/4

QUESTION 2. Find $f'(x)$ and do not simplify

a) $f(x) = 3x^2(x+2)^2 + 2018x - 2017$

$f'(x) = \underbrace{6x(x+2)^2 + 6x^2(x+2)}_{\text{Product formula}} + 2018$ ✓ 2/2

or $f(x) = 3x^2(x^2 + 4x + 4) + 2018x - 2017$

$= 3x^4 + 12x^3 + 12x^2 + 2018x - 2017$

so $f'(x) = 12x^3 + 36x^2 + 24x + 2018$

b) $f(x) = 8\sqrt{x} + \frac{6}{x^3} + 2x^2$

$f'(x) = \frac{4}{\sqrt{x}} - \frac{18}{x^4} + 4x$ ✓ 2/2

c) If $f(x) = 18\sqrt{x} + 7x + 1$, find $f'(9)$

$f'(x) = \frac{9}{\sqrt{x}} + 7 \Big|_{x=9} = 10$ ✓ 2/2

. Faculty information

Ayman Badawi, Department of Mathematics & Statistics, American University of Sharjah, P.O. Box 26666, Sharjah, United Arab Emirates.
E-mail: abadawi@aus.edu, www.ayman-badawi.com

Name NADIN ELSHIRBINI , ID 72434

15/15

Quiz 5: MTH 111, Spring 2018

In fact it is Quiz 6 Ayman Badawi

QUESTION 1. a) The Plane $P: 2x + y - z = 16$ intersects the line $L: x = 3t, y = -2t + 4, z = -t - 2$ at a point Q find Q.

$2(3t) - 2t + 4 + t + 2 = 16$

$6t - 2t + 4 + t + 2 = 16$

$t = 2$ 1/2

$\boxed{Q(6,0,-4)}$ 1/2

$x = 3(2) = 6$

$y = -2(2) + 4 = 0$

$z = -2 - 2 = -4$

4/4

c) The two planes $P_1: 2x + y - z = 6$ and $P_2: 4x - y + z = 12$ intersect in a line L. Find a parametric equations of L.

$N_1: \langle 2, 1, -1 \rangle \quad N_2 \langle 4, -1, 1 \rangle$

$D = N_1 \times N_2 = \begin{vmatrix} i & j & k \\ 2 & 1 & -1 \\ 4 & -1 & 1 \end{vmatrix} = \langle 0, -6, -6 \rangle$ 1/2

$\boxed{L: \begin{cases} x = 3 \\ y = -6t \\ z = -6t \end{cases} ; t \in \mathbb{R}}$

take $z = 0$

$2x + y = 6$

$4x - y = 12$

$x = 3 \quad y = 0$

$\Rightarrow Q(3,0,0)$ 1/2

4/4

QUESTION 2. Find $f'(x)$ and do not simplify

a) $f(x) = 3x^2(x + 2)^2 + 2018x - 2017$

$f'(x) = 6x(x+2)^2 + 6x^2(x+2) + 2018$ 1/2

Product formula

or $f(x) = 3x^2(x^2 + 4x + 4) + 2018x - 2017$

$= 3x^4 + 12x^3 + 12x^2 + 2018x - 2017$

so

$f'(x) = 12x^3 + 36x^2 + 24x + 2018$

b) $f(x) = 8\sqrt{x} + \frac{6}{x^3} + 2x^2$

$f'(x) = \frac{4}{\sqrt{x}} - \frac{18}{x^4} + 4x$ 1/2

c) If $f(x) = 18\sqrt{x} + 7x + 1$, find $f'(9)$

$f'(x) = \frac{9}{\sqrt{x}} + 7 \Big|_{x=9} = 10$ 1/2

, **Faculty information**

Ayman Badawi, Department of Mathematics & Statistics, American University of Sharjah, P.O. Box 26666, Sharjah, United Arab Emirates.
E-mail: abadawi@aus.edu, www.ayman-badawi.com

Name

Quiz 7: MTH 111, Fall 2017

Ayman Badawi

$\frac{15}{15}$

QUESTION 1. Let $f(x) = 6\sqrt{2x+1} + 4x - 2$. $= 6(2x+1)^{1/2} + 4x - 2$

(i) Find the the equation of the tangent line to the curve of $f(x)$ when x = 4.

$f(4) = 6\sqrt{2(4)+1} + 4(4) - 2 = 32$

$f'(x) \cancel{=0} \to 3(2x+1)^{-1/2}(2) + 4 = \frac{6}{\sqrt{2x+1}} + 4 \cancel{=0} \Rightarrow \overset{f'(4)}{\frac{6}{\sqrt{2(4)+1}} + 4} = 6 = m$

$y = mx + b$

$32 = 6(4) + b \Rightarrow b = 32 - 24 = 8$

eq. of tangent line : $\boxed{y = 6x + 8}$

(ii) Find the the equation of the normal line to the curve of $f(x)$ when x = 4.

$m \times n = -1 \Rightarrow 6n = -1 \Rightarrow n = -\frac{1}{6}$

eq. of normal line : $\boxed{y = -\frac{1}{6}x + \frac{98}{3}}$

$y = nx + c \Rightarrow 32 = -\frac{1}{6}(4) + c \Rightarrow c = 32 + \frac{4}{6} = \frac{98}{3}$

QUESTION 2. Let $f(x) = (x^2 - 4x - 3)^3$.

(i) Find all critical values of $f(x)$

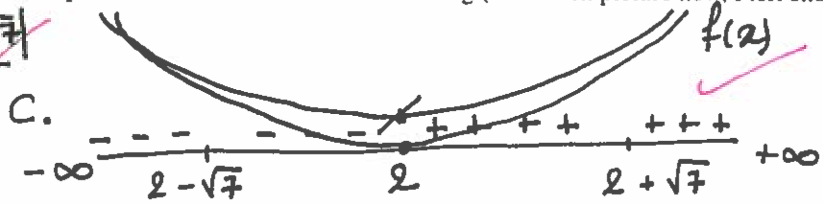
$f'(x) = 0 \Rightarrow 3(x^2 - 4x - 3)^2 . (2x - 4) = 0$

$x^2 - 4x - 3 = 0$ $\quad$ $2x - 4 = 0$

~~(x − 1)(~~ $\quad$ $\boxed{x = 2}$

(ii) Use one picture as I explained in class to answer the following (draw such picture now, I left enough space)

$\boxed{x = 2 + \sqrt{7}\ ,\ x = 2 - \sqrt{7}}$



a. For what values of x does $f(x)$ increase?

b. For what values of x, does $f(x)$ decrease?

c. Draw, roughly, the curve of $f(x)$ (you may draw it in the picture above!)

d. Find all local max. points and all local min. points of $f(x)$

$f'\left(\frac{4+\sqrt{7}}{2}\right) > 0$

$f'\left(\frac{4-\sqrt{7}}{2}\right) < 0$

$f'(3+\sqrt{7}) > 0$

$f'(1 - \sqrt{7}) < 0$

a. $(2, +\infty)$

b. $(-\infty, 2)$

d. no local max. points

local min point : $(\overset{x}{2}, \overset{y}{-343})$

$f(x) = y = (2^2 - 4(2) - 3)^3 = -343$

Faculty information

Ayman Badawi, Department of Mathematics & Statistics, American University of Sharjah, P.O. Box 26666, Sharjah, United Arab Emirates.
E-mail: abadawi@aus.edu, www.ayman-badawi.com

Name [illegible], ID [illegible]

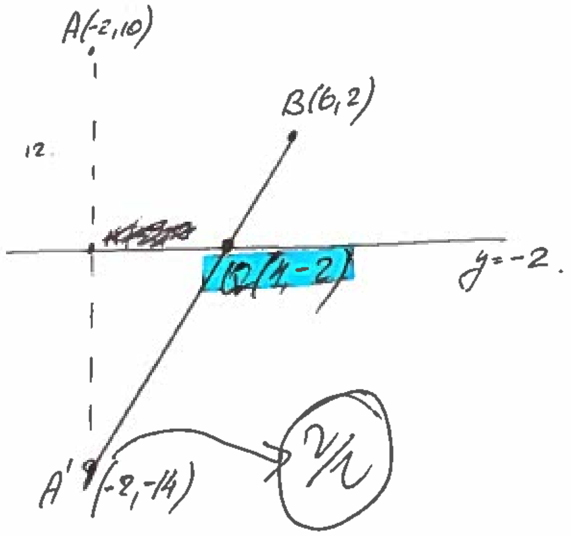
Olga

Quiz 3: MTH 111, Fall 2017

Ayman Badawi

15/15

QUESTION 1. Let $A = (-2, 10), B = (6, 2)$. Find a point on the line $y = -2$, say Q, such that $|AQ| + |QB|$ is minimum.



$y = mx + b$ $\Delta y = 2-(-14) = 2+14 = 16$ $\boxed{m = \frac{16}{8} = 2}$

$m = \frac{\Delta y}{\Delta x}$ $\Delta x = 6-(-2) = 6+2 = 8$

to find b: $y = mx + b$ $2 = 12 + b$

$2 = 2\cdot 6 + b$ $\boxed{b = -10}$

3/3

$y = 2\cdot x - 10$

to find Q: $-2 = 2\cdot x - 10$

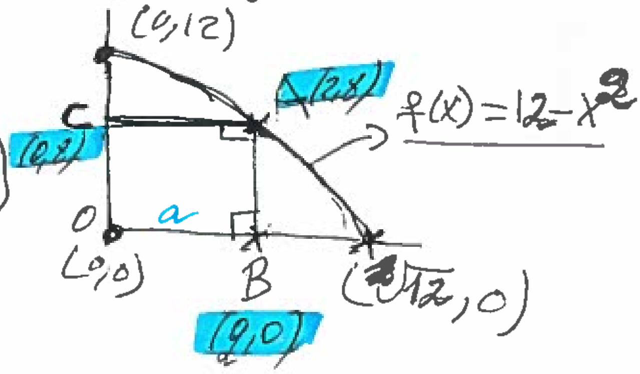
$-2 + 10 = 2x$

$8 = 2x$ $\Rightarrow$ Q(4,-2)

$x = 4$

2/2

QUESTION 2. Let $f(x) = 12 - x^3$ where $0 \le x \le \sqrt[3]{12}$. We need to construct a rectangle inside the curve of $f(x)$ (see picture) so that the area of such rectangle is maximum. Find the points A, B. Find the length and the width of such rectangle.



~~let~~

Width $= |OB| = |CA| = a$

Length $= 12 - a^2 = |OC| = |BA|$

Area = Length x width $= (12 - a^2)a = 12a - a^3$

$Area' = 12\cdot 1 a^{1-1} - 3a^{3-1} = \boxed{12 - 3a^2}$ 3/3

to find a: $A' = 0$: $12 - 3a^2 = 0$

$12 = 3a^2$

$a^2 = 4 \Rightarrow a = \pm 2$; we take positive $a = 2$.   3/3

$A' = 12 - 3a^2$

$A'' = 0 - 3\cdot 2a^{2-1} = \boxed{-6a}$

$A''(2) = -6\cdot 2 = -12$ $A'' < 0 \Rightarrow$ rectangle with max area is when $a = 2$.

2/2

Width $= |OB| = |CA| = a = 2$

Length $= |OC| = |BA| = 12 - a^2 = 12 - 2^2 = 12 - 4 = 8$

Points: B(2,0) A(2,8) C(0,8)

Faculty information

Ayman Badawi, Department of Mathematics & Statistics, American University of Sharjah, P.O. Box 26666, Sharjah, United Arab Emirates.
E-mail: abadawi@aus.edu, www.ayman-badawi.com

Name NIHA ALI, ID 10024

Niha Ali

15/15

Quiz 9: MTH 111, spring 2018

Ayman Badawi

QUESTION 1. Find y' and do not simplify

(i) $y = 12e^{(3x^2+7x-7)}$

(ii) $x\sqrt{16-x^2}$

(iii) $(2x+1)e^{(x^2+x)}$

(i) $y = 12e^{(3x^2+7x-7)}$

$y' \Rightarrow \boxed{12e^{(3x^2+7x-7)}(6x+7)}$

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

$y = x(16-x^2)^{1/2}$

$y' = 1(16-x^2)^{1/2} + x \times 1/2(16-x^2)^{-1/2}(-2x)$

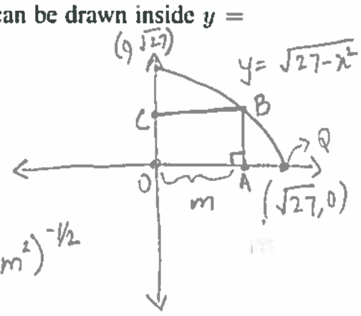
$y' = \boxed{(16-x^2)^{1/2} - x^2(16-x^2)^{-1/2}}$

(iii) $y = (2x+1)e^{(x^2+x)}$

$y' = 2e^{(x^2+x)} + (2x+1) \times e^{(x^2+x)} \times (2x+1)$

$y' = \boxed{2e^{(x^2+x)} + (2x+1)^2 e^{(x^2+x)}}$

QUESTION 2. Find the length and the width of the rectangle that has maximum area and it can be drawn inside $y = \sqrt{27-x^2}$ (see picture)



$y = f(x) = \sqrt{27-x^2}$

$w = m$

$l = \sqrt{27-m^2}$

$A = l \times w$

$A = m\sqrt{27-m^2}$

$A = m(27-m^2)^{1/2}$

$A' = 1(27-m^2)^{1/2} + m \times \left[\frac{1}{2}(27-m^2)^{-1/2}(-2m)\right]$

$A' = (27-m^2)^{1/2} - m^2(27-m^2)^{-1/2}$

$A' = 0$

$(27-m^2)^{1/2} - m^2(27-m^2)^{-1/2} = 0$

$\Rightarrow (27-m^2)^{1/2} = m^2(27-m^2)^{-1/2}$

$\Rightarrow (27-m^2)^{1/2} = \frac{m^2}{(27-m^2)^{1/2}}$

$\Rightarrow (27-m^2) = m^2$

$\Rightarrow 27 = m^2 + m^2$

$\Rightarrow 2m^2 = 27$

$m = \frac{3\sqrt{6}}{2}$

$w = \boxed{\frac{3\sqrt{6}}{2}}$

$l = \sqrt{27-\left(\frac{3\sqrt{6}}{2}\right)^2} \Rightarrow \boxed{\frac{3\sqrt{6}}{2}}$

Faculty information

Ayman Badawi, Department of Mathematics & Statistics, American University of Sharjah, P.O. Box 26666, Sharjah, United Arab Emirates.
E-mail: abadawi@aus.edu, www.ayman-badawi.com