11/17

Friday, November 17, 2017 11:00 AM

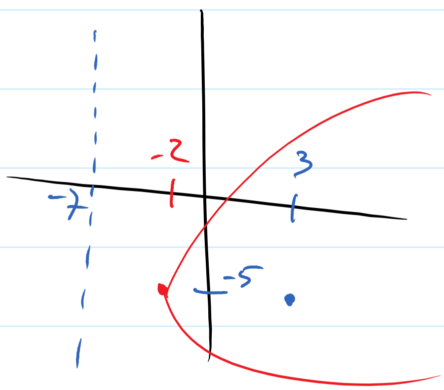
Exam review on Saturday 11/18, 10 am - noon at MMC, CP145

Online Office hour on Sunday, 11/19, starting at 8pm

Chapter 10:

focus : $(3, -5)$

directrix: $x = -7$



vertex: $(-2, -5)$, $p = 5$

$$(y-(-5))^2 = 4 \cdot \underbrace{5}(x-(-2))$$

$$\boxed{(y+5)^2 = 20(x+2)}$$

The latus rectum of a parabola $(x-h)^2 = 4p(y-k)$ or $(y-k)^2 = 4p(x-h)$ is

$|4p|$.

Section 11.1 - Sequences

- $1, 3, 5, 7, 9, 11, \ldots$
- $2, 4, 6, 8, 10, \ldots$
- $0, 3, -2, 1, -5, -3, 4, -10, \ldots$

Def: An infinite sequence $\{a_n\}$ is a function whose domain is the set of positive integers. The function values, or terms, of the sequence are represented by,

$$a_1, a_2, a_3, \ldots, a_n, \ldots$$

Sequences whose domains consist only of the first n positive integers are called finite sequences.

$1, 3, 5, 7, 9, \ldots$ is a sequence, where the function is $f(n) = 2n-1$

$f(1) = a_1 = 2\cdot 1 - 1 = 1$

$f(2) = a_2 = 2\cdot 2 - 1 = 3$

$f(3) = a_3 = 2\cdot 3 - 1 = 5$

$\vdots$

$a_n = 2n-1$

n^{th} term

$$a_{85} = 2 \cdot 85 - 1 = 169$$

Ex: Find the first four terms of the seq:

- $a_n = 3n+4$

$a_1 = 3 \cdot 1 + 4 = 7$

$a_2 = 3 \cdot 2 + 4 = 10$

$a_3 = 3 \cdot 3 + 4 = 13$

$a_4 = 3 \cdot 4 + 4 = 16$

- $a_n = \dfrac{(-1)^n}{3^n - 1}$

$a_1 = \dfrac{(-1)}{3-1} = \dfrac{-1}{2}$

$a_2 = \dfrac{(-1)^2}{3^2-1} = \dfrac{1}{9-1} = \dfrac{1}{8}$

$a_3 = \dfrac{(-1)^3}{3^3-1} = \dfrac{-1}{27-1} = \dfrac{-1}{26}$

$a_4 = \dfrac{(-1)^4}{3^4-1} = \dfrac{1}{81-1} = \dfrac{1}{80}$

A sequence can be defined using the general term formula ($a_n = 3n+4$) or using a <u>recursive formula</u> ($a_1 = 7$, $a_n = \underbrace{a_{n-1} + 3}_{\text{add 3 to the prev. term}}$)

Ex: Find $a_1, a_2, \ldots, a_4$ of the sequence:

$a_1 = 5$, $a_n = 3a_{n-1} + 2$ for $n \geq 2$.

$a_1 = 5$

$a_2 = 3\cdot 5 + 2 = 17$

$a_3 = 3\cdot 17 + 2 = 54$

$a_4 = 3\cdot 54 + 2 = 164$

<u>Ex:</u> Find $a_3, a_4, \ldots, a_8$ of the sequence:

$a_1 = 1, \quad a_2 = 1, \quad a_n = a_{n-1} + a_{n-2}, \text{ for } n \geq 3.$

$$\underbrace{1, 1, 2, 3, 5, 8, 13, 21, 33, 54, \ldots}_{\text{Fibonacci sequence}}$$

Factorial

Def: If n is a positive integer, the notation $n!$ is the product of positive integers from n down through 1.

$9! = 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1$

Also, $0! = 1$

$$n! = n\cdot(n-1)\cdot(n-2)\cdot\ldots\cdot 3\cdot 2\cdot 1$$

Ex: Simplify $\frac{11!}{6!\,4!} = \frac{11\cdot 10\cdot \cancel{9}^{3}\cdot \cancel{8}\cdot \cancel{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}{\cancel{6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}\cdot \cancel{4}\cdot \cancel{3}\cdot \cancel{2}\cdot 1}$

$= \frac{11\cdot 10\cdot 3\cdot 7}{1} = 110\cdot 21 = \underline{2310}$

Ex: Find a_1, a_2, a_3

$$a_n = \frac{2^n}{(n-1)!}$$

$$a_1 = \frac{2^1}{(1-1)!} = \frac{2}{0!} = \frac{2}{1} = \boxed{2}$$

$$a_2 = \frac{2^2}{(2-1)!} = \frac{4}{1} = \boxed{4}$$

$$a_3 = \frac{2^3}{(2)!} = \frac{8}{2} = \boxed{4}$$