Summary of Function of Cranial Nerves

Cranial nerves I – VI	Sensory function	Motor function	PS* fibers
I Olfactory	Yes (smell)	No	No
II Optic	Yes (vision)	No	No
III Oculomotor	No	Yes	Yes
IV Trochlear	No	Yes	No
V Trigeminal	Yes (general sensation)	Yes	No
VI Abducens	No	Yes	No

Cranial nerves VII – XII	Sensory function	Motor function	PS* fibers
VII Facial	Yes (taste)	Yes	Yes
VIII Vestibulocochlear	Yes (hearing and balance)	No	No
IX Glossopharyngeal	Yes (taste)	Yes	Yes
X Vagus	Yes (taste)	Yes	Yes
XI Accessory	No	Yes	No
XII Hypoglossal	No	Yes	No

(b) *PS = parasympathetic

Figure 13.5b

Cranial Nerve I: Olfactory

- Arises from the olfactory epithelium
- Passes through the cribriform plate of the ethmoid bone
- Fibers run through the olfactory bulb and terminate in the primary olfactory cortex
- Functions solely by carrying afferent impulses for the sense of smell

Cranial Nerve I: Olfactory

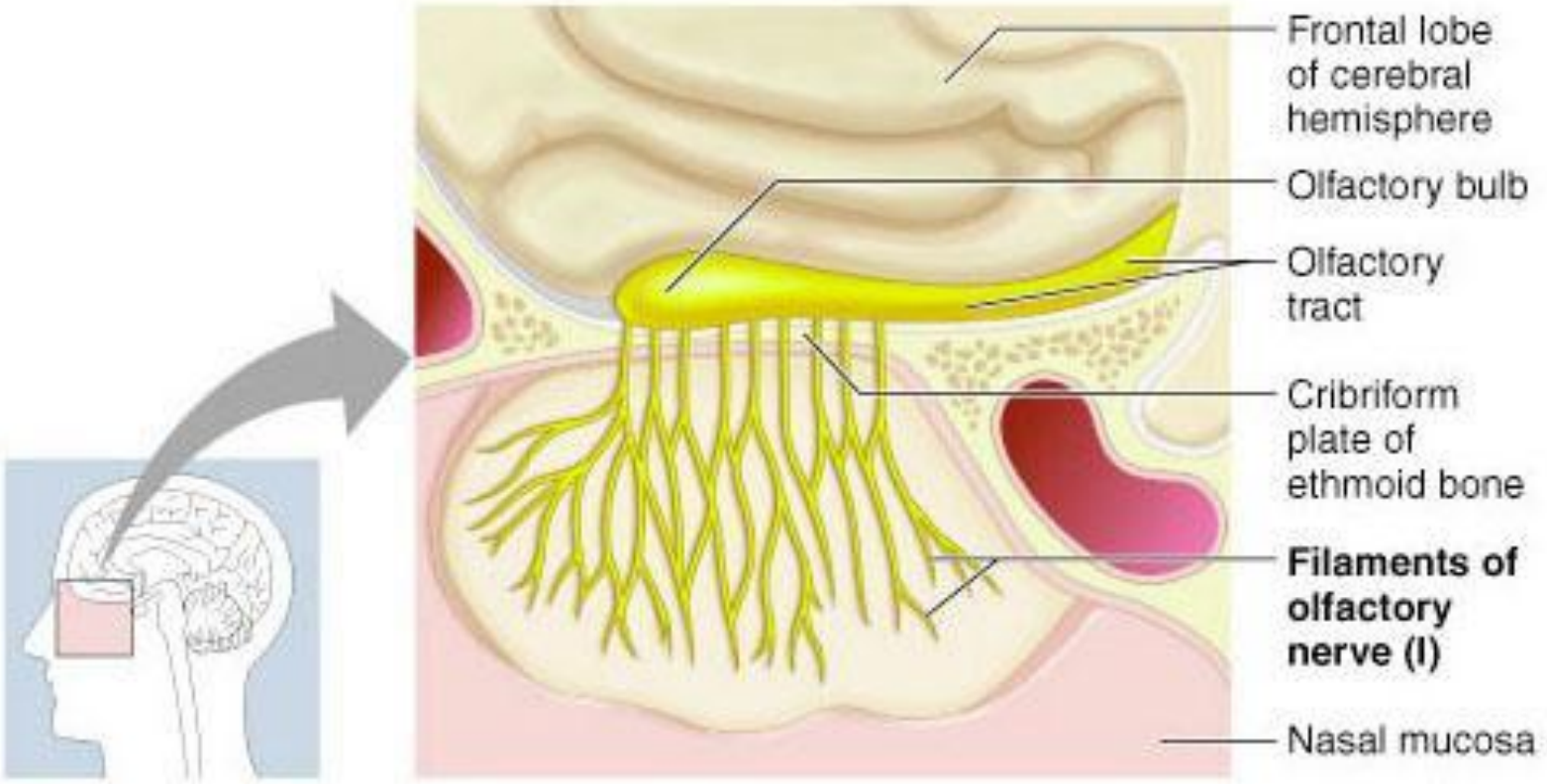


Figure I from Table 13.2

Cranial Nerve II: Optic

- Arises from the retina of the eye
- Optic nerves pass through the optic canals and converge at the optic chiasm
- They continue to the thalamus where they synapse
- From there, the optic radiation fibers run to the visual cortex
- Functions solely by carrying afferent impulses for vision

Cranial Nerve II: Optic

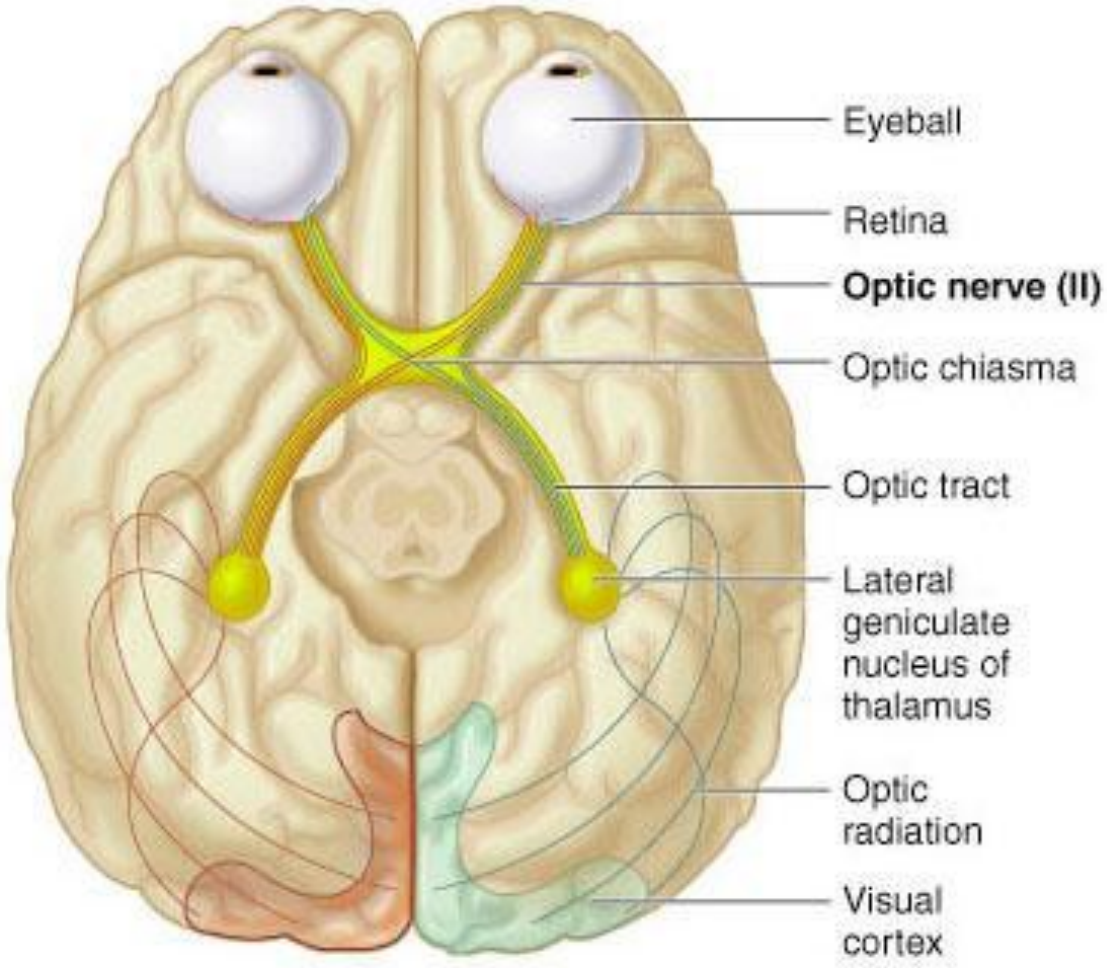


Figure II Table 13.2

Cranial Nerve III: Oculomotor

- Fibers extend from the ventral midbrain, pass through the superior orbital fissure, and go to the extrinsic eye muscles
- Functions in raising the eyelid, directing the eyeball, constricting the iris, and controlling lens shape
- The latter 2 functions are parasympathetically controlled
- Parasympathetic cell bodies are in the ciliary ganglia

Cranial Nerve III: Oculomotor

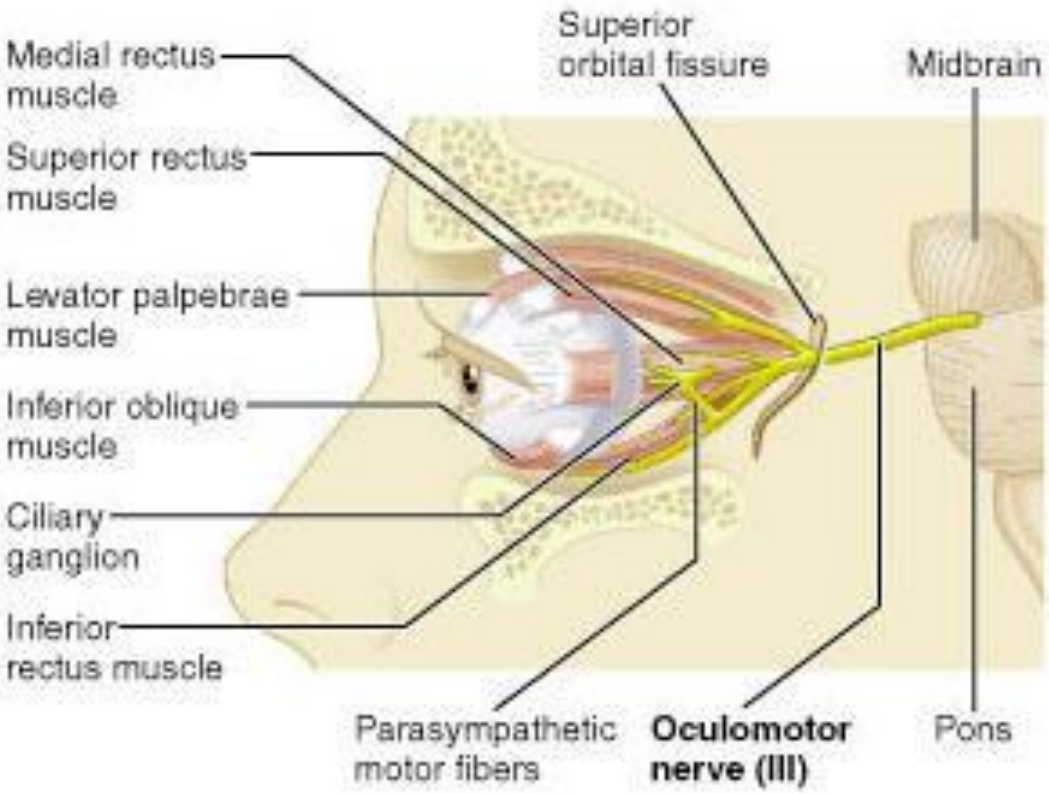


Figure III from Table 13.2

Cranial Nerve IV: Trochlear

- Fibers emerge from the dorsal midbrain and enter the orbits via the superior orbital fissures; innervate the superior oblique muscle
- Primarily a motor nerve that directs the eyeball

Cranial Nerve IV: Trochlear

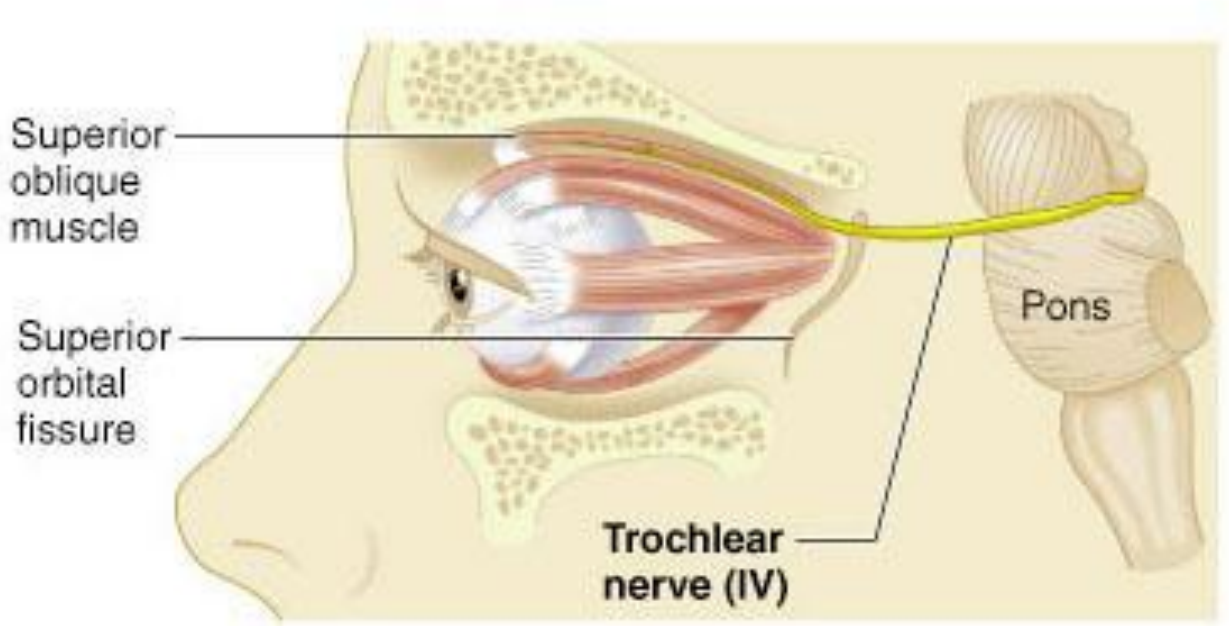
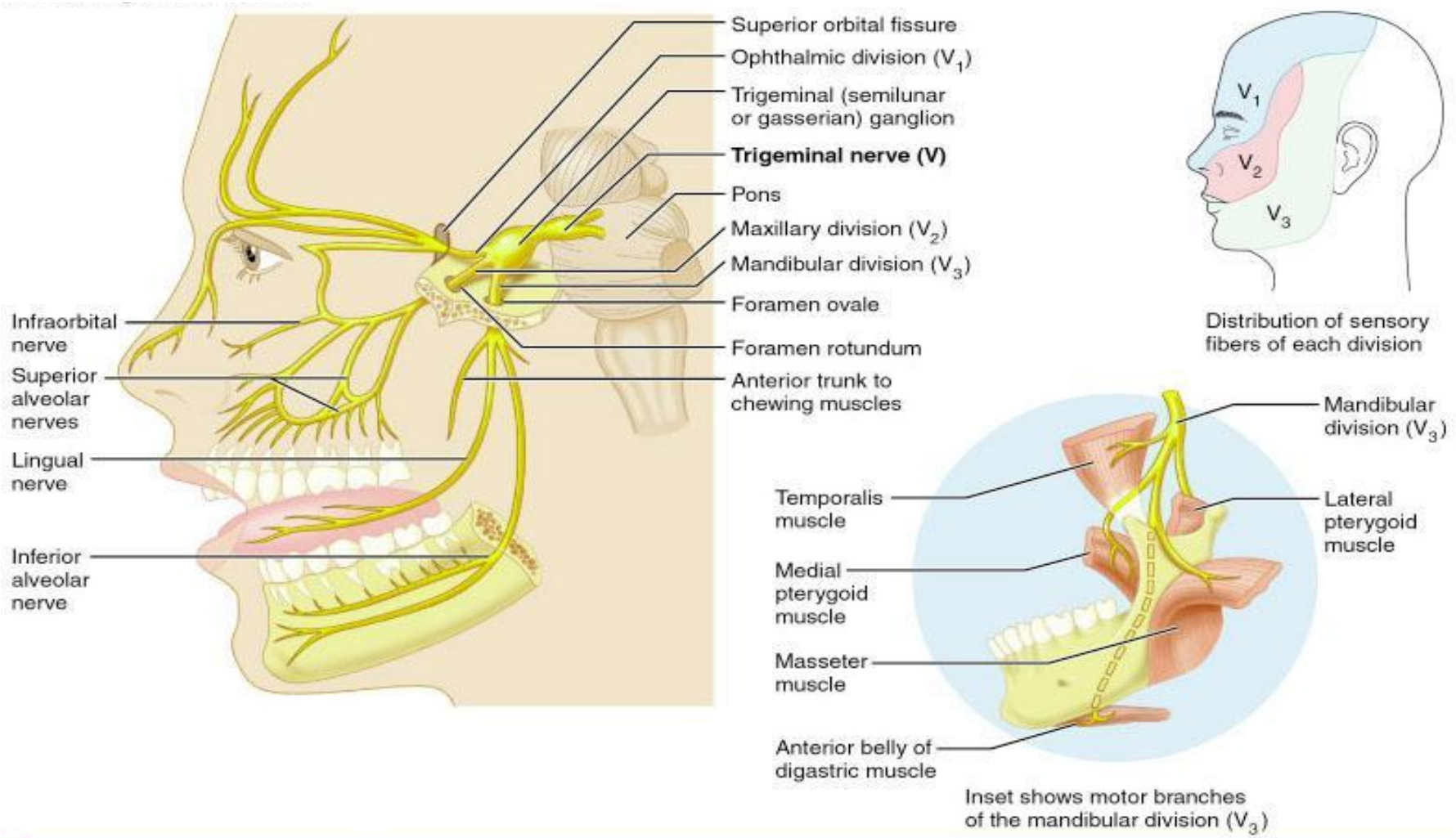


Figure IV from Table 13.2

Cranial Nerve V: Trigeminal

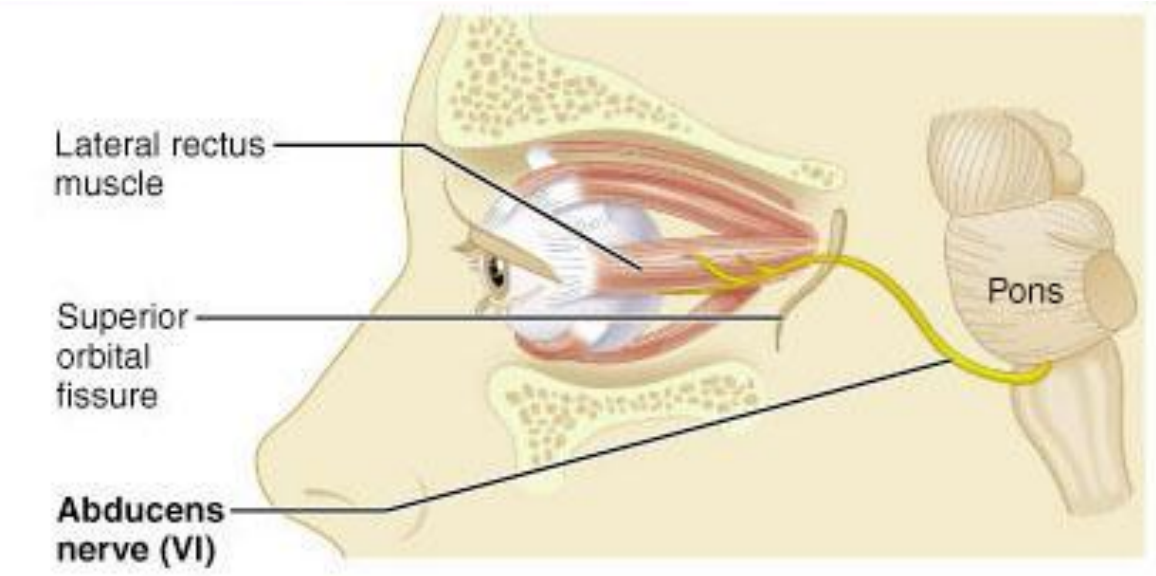
- Composed of three divisions
  - Ophthalmic (V_1)
  - Maxillary (V_2)
  - Mandibular (V_3)
- Fibers run from the face to the pons via the superior orbital fissure (V_1), the foramen rotundum (V_2), and the foramen ovale (V_3)
- Conveys sensory impulses from various areas of the face (V_1) and (V_2), and supplies motor fibers (V_3) for mastication
- *Tic douloureux* or trigeminal neuralgia
  - Most excruciating pain known (?)
  - Caused by inflammation of nerve
  - In severe cases, nerve is cut; relieves agony but results in loss of sensation on that side of the face

Cranial Nerve V: Trigeminal



Cranial Nerve VI: Abducens

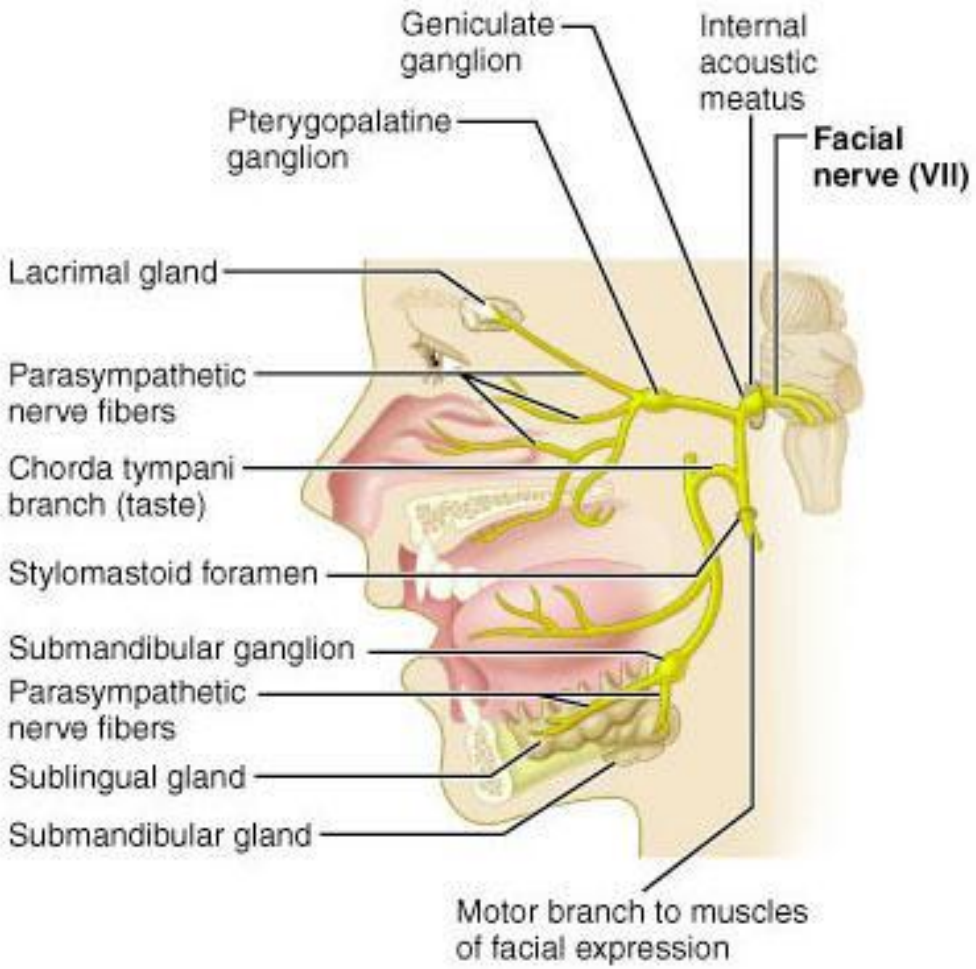
- Fibers leave the inferior pons and enter the orbit via the superior orbital fissure
- Primarily a motor nerve innervating the lateral rectus muscle (abducts the eye; thus the name *abducens)*



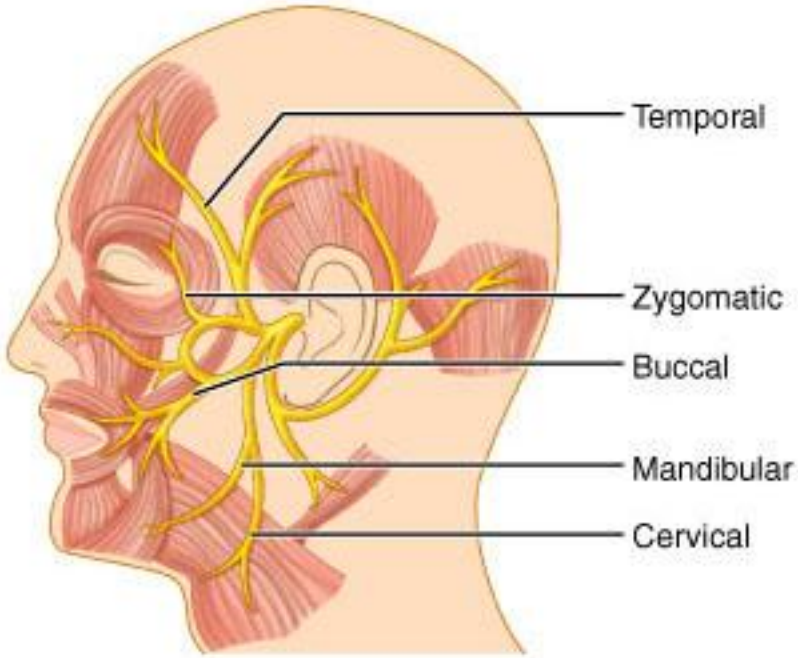
Cranial Nerve VII: Facial

- Fibers leave the pons, travel through the internal acoustic meatus, and emerge through the stylomastoid foramen to the lateral aspect of the face
- Motor functions include;
  - Facial expression
  - Transmittal of parasympathetic impulses to lacrimal and salivary glands (submandibular and sublingual glands)
- Sensory function is taste from taste buds of anterior two-thirds of the tongue

Cranial Nerve VII: Facial



(a) Parasympathetic efferents and sensory afferents



(b) Motor branches to muscles of facial expression and scalp muscles

Figure VII from Table 13.2

Facial Nerve (CN VII)

- *Bell's palsy*: paralysis of facial muscles on affected side and loss of taste sensation
- Caused by herpes simplex I virus
- Lower eyelid droops
- Corner of mouth sags
- Tears drip continuously and eye cannot be completely closed (dry eye may occur)
- Condition my disappear spontaneously without treatment

Cranial Nerve VIII: Vestibulocochlear

- Fibers arise from the hearing and equilibrium apparatus of the inner ear, pass through the internal acoustic meatus, and enter the brainstem at the pons-medulla border
- Two divisions – cochlear (hearing) and vestibular (balance)
- Functions are solely sensory – equilibrium and hearing

Cranial Nerve VIII: Vestibulocochlear

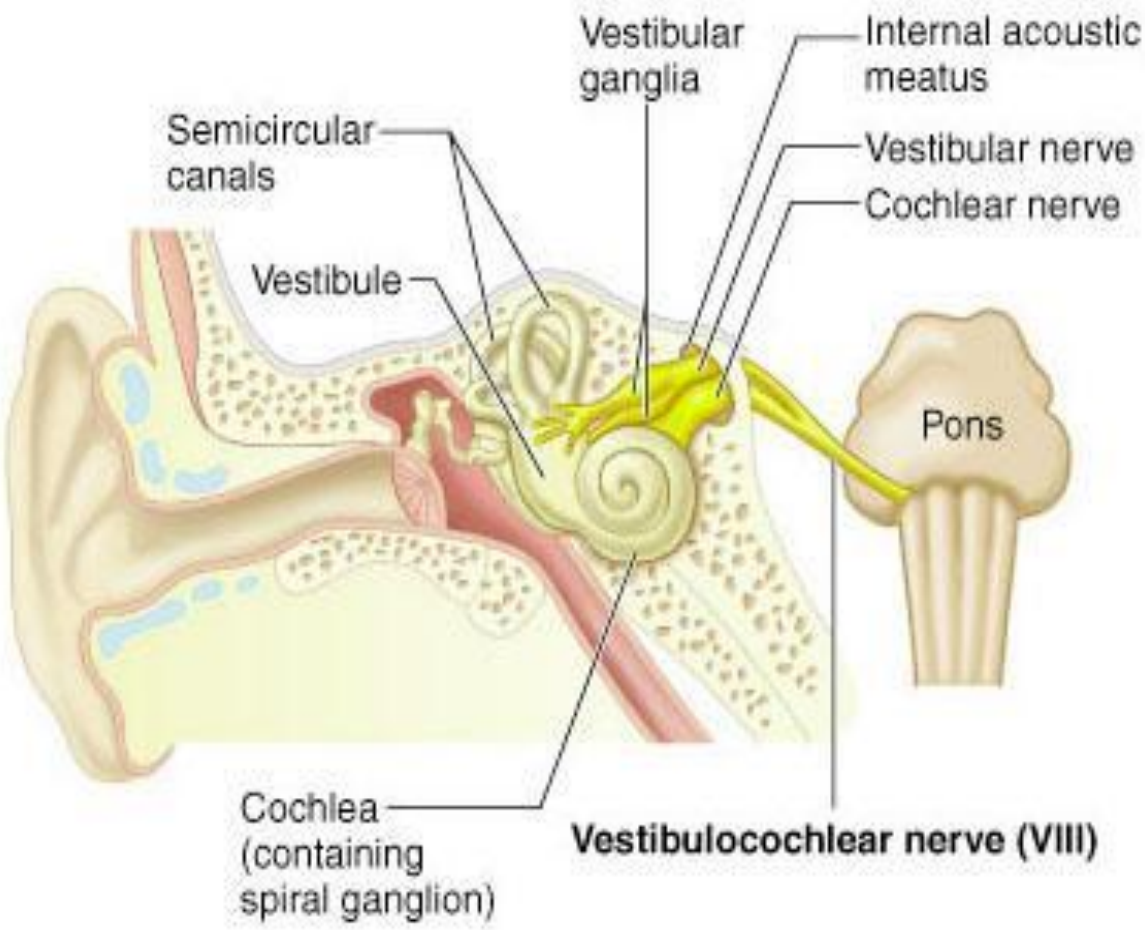


Figure VIII from Table 13.2

Cranial Nerve IX: Glossopharyngeal

- Fibers emerge from the medulla, leave the skull via the jugular foramen, and run to the throat
- Nerve IX is a mixed nerve with motor and sensory functions
- Motor – innervates part of the tongue and pharynx, and provides motor fibers to the parotid salivary gland
- Sensory – fibers conduct taste and general sensory impulses from the tongue and pharynx

Cranial Nerve IX: Glossopharyngeal

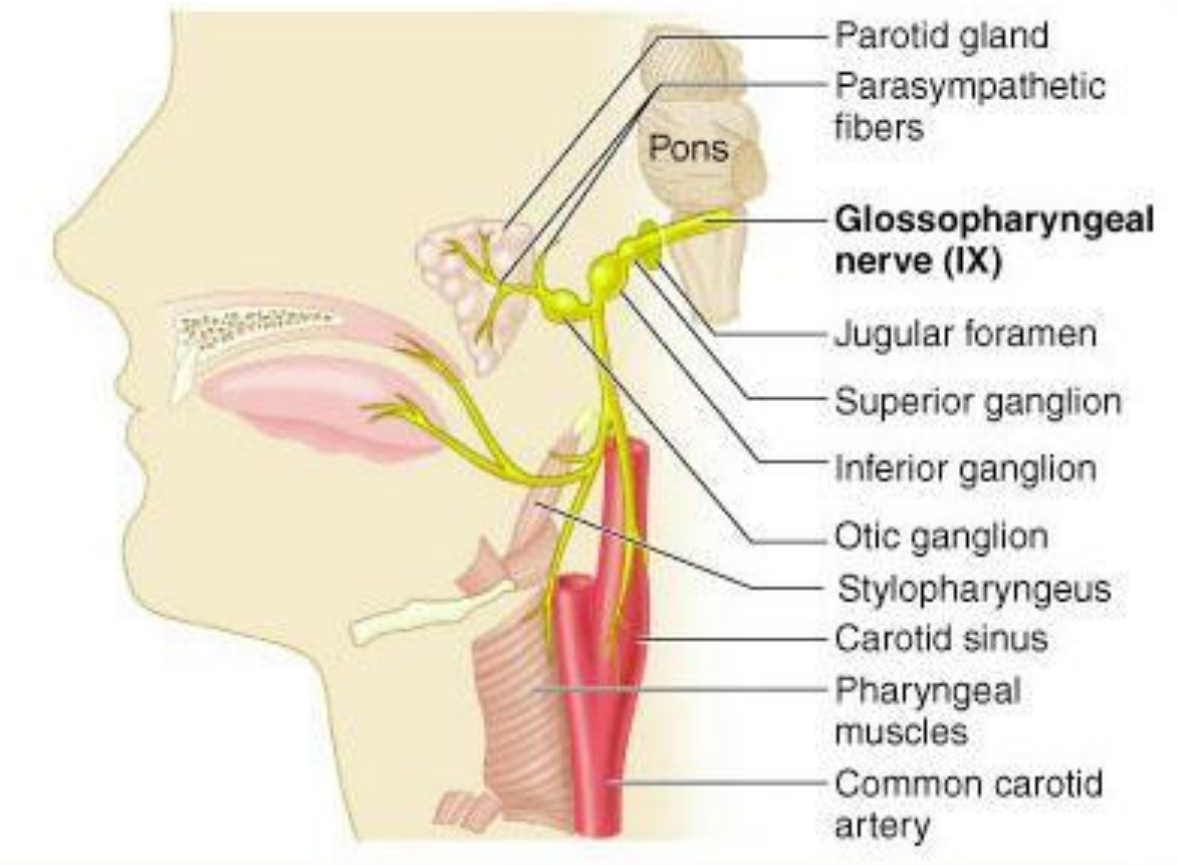
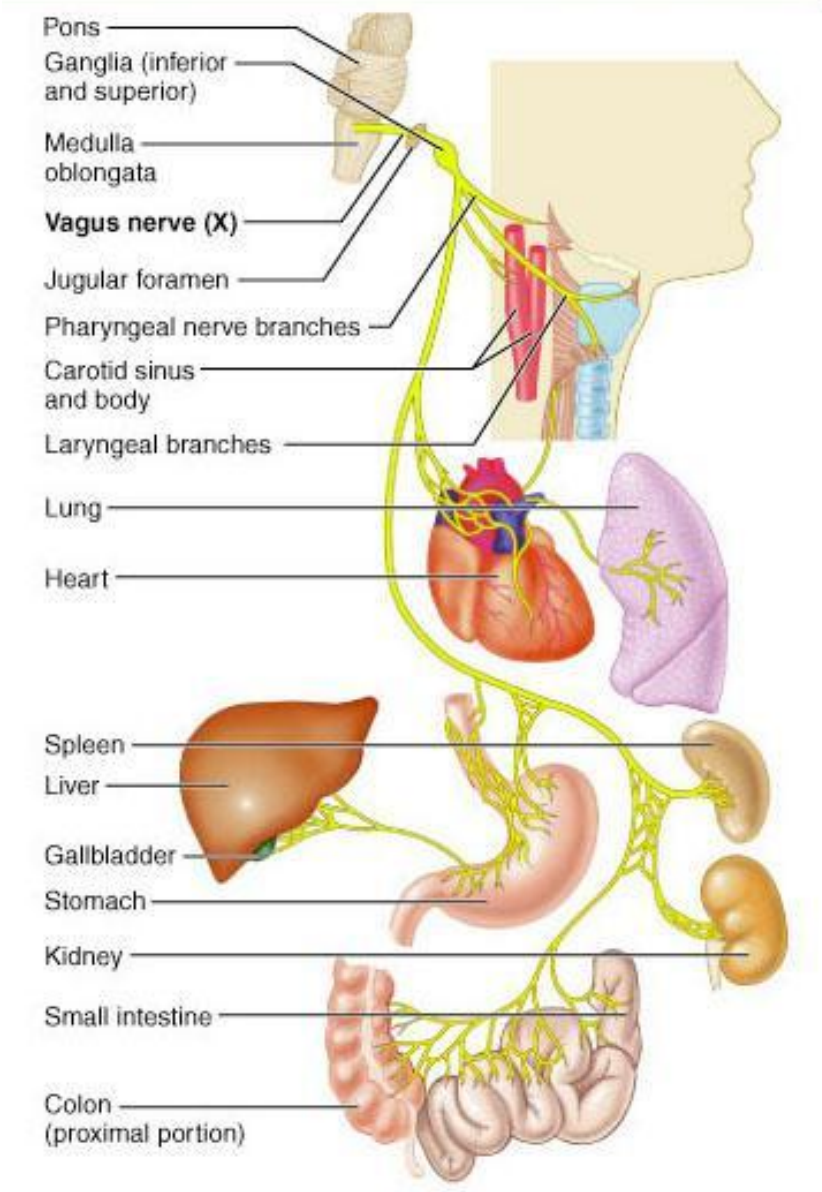


Figure IX from Table 13.2

Cranial Nerve X: Vagus

- The only cranial nerve that extends beyond the head and neck
- Fibers emerge from the medulla via the jugular foramen
- The vagus is a mixed nerve
- Most motor fibers are parasympathetic fibers to the heart, lungs, and visceral organs
- Its sensory function is in taste
- Paralysis leads to hoarseness
- Total destruction incompatible with life

Cranial Nerve X: Vagus



Cranial Nerve XI: Accessory

- Formed from a cranial root emerging from the medulla and a spinal root arising from the superior region of the spinal cord
- The spinal root passes upward into the cranium via the foramen magnum
- The accessory nerve leaves the cranium via the jugular foramen
- Primarily a motor nerve
  - Supplies fibers to the larynx, pharynx, and soft palate
  - Innervates the trapezius and sternocleidomastoid, which move the head and neck

Cranial Nerve XI: Accessory

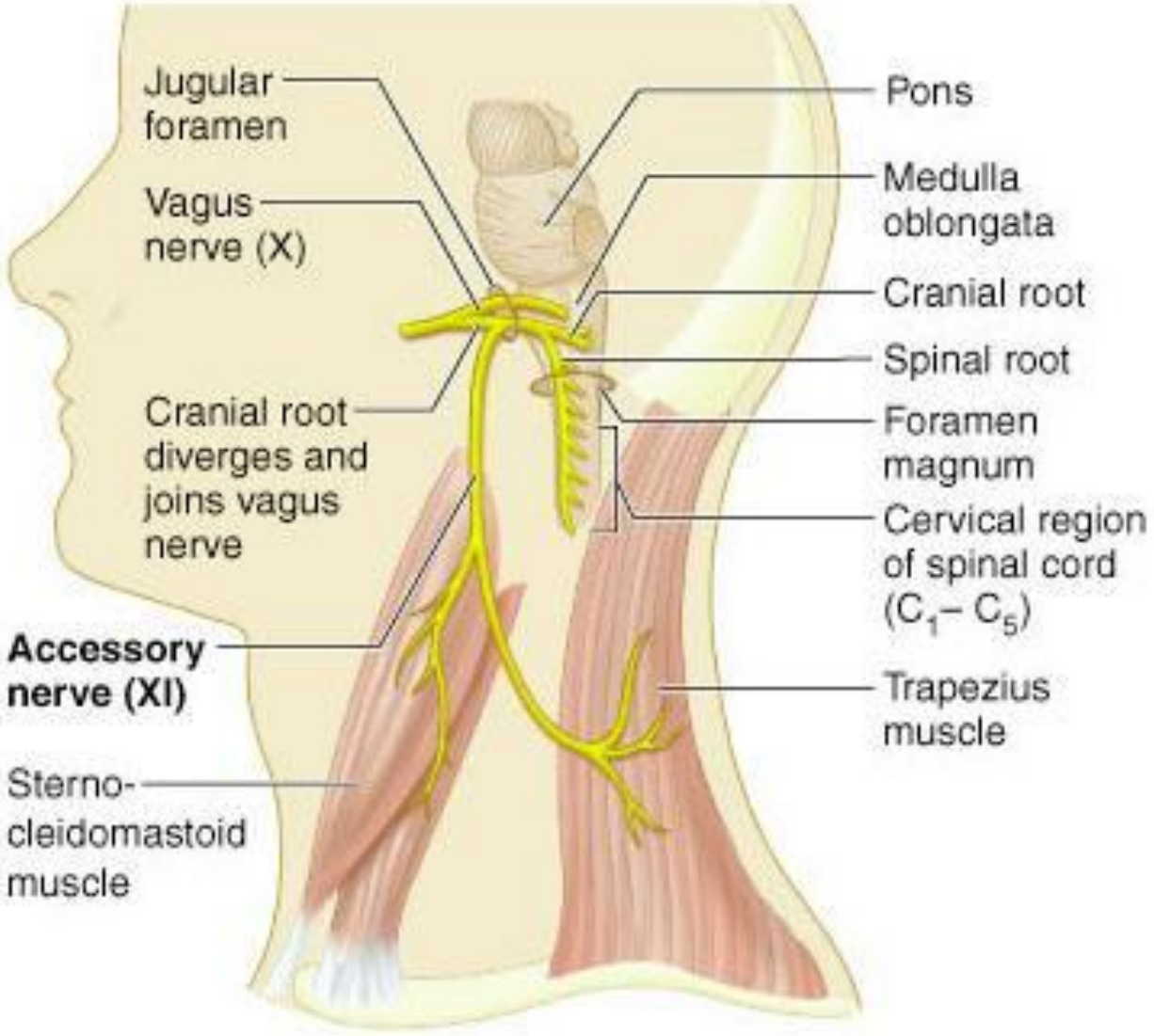


Figure XI from Table 13.2

Cranial Nerve XII: Hypoglossal

- Fibers arise from the medulla and exit the skull via the hypoglossal canal
- Innervates both extrinsic and intrinsic muscles of the tongue, which contribute to swallowing and speech
- If damaged, difficulties in speech and swallowing; inability to protrude tongue

Cranial Nerve XII: Hypoglossal

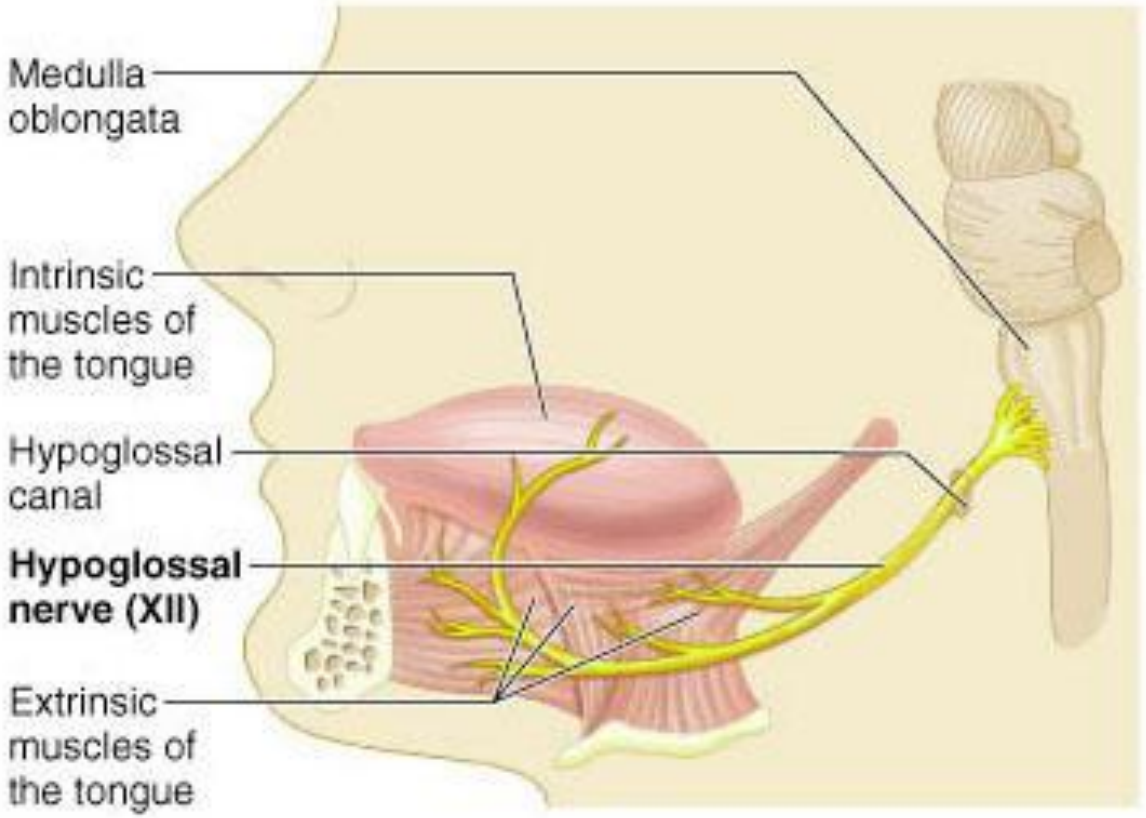


Figure XII from Table 13.2