1. a.) A cell in the mammalian nervous system has differentiated into a neuron. After differentiation the cell sprouts an axon which grows along previously placed axon paths. However, this pathway eventually ends. Now, the axon has the ability to grow based on chemoattractant/repellant gradients. There are two groups of cells in front of the axon. Group 1 cells all express the guidance factor slit while group 2 cells all express the guidance factor netrin. Assuming that the axon expresses receptors to both slit and netrin, which group of cells (i.e. group 1 or 2) will the axon most likely grow towards and why? (1 point)

They grow toward Group 1 b/c netrin is an attractant and slit is a repellant.

b.) What is the name of slit’s receptor? (1 point)

robo

c.) Mutations of this receptor in humans sometimes result in Horizontal Gaze Palsy with Progressive Scoliosis. Given what you learned in class about the functions of netrin and its receptor in the nervous system, how do you think mutating the receptor might lead to scoliosis? (1 point)

interfering with axonal guidance in the developing nervous system leads to disruptions in the scaffolding of the spine and thus the spine is crooked.

2. a.) Describe the difference between a monosynaptic reflex and a polysynaptic reflex. (1 points)

monosynaptic
polysynaptic

b.) You’re not thinking quite right and decide to walk barefoot in a junkyard. Low and behold you step on a rusty nail. Aside from probably acquiring tetanus, you immediately react by withdrawing your leg from the nail. Is this type of reflex monosynaptic or polysynaptic? Outline the steps involved in the reflex, including which muscles (extensors or flexors) are excited or inhibited. What prevents you from toppling over when you withdraw the pricked toe? (2 points)

Stepping on a nail activates pain afferents in the skin. Interneurons in the dorsal horn are activated, which in turn, excite flexors and inhibit extensors. The person
would fall if the crossed extensors weren’t activated and the crossed flexors weren’t inhibited to extend the contralateral leg.

3. Below is a diagram of a cross-section through the human spinal cord. In each blank, write the letter/s that correspond to the appropriate part of the spinal cord. A letter can be used more than once and more than one answer may be required for certain questions. (2 points)

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c ______ dorsal root ganglion

d ______ ventral root

f, g ______ white matter

a, e ______ grey matter

b ______ dorsal root

a ______ posterior (dorsal) horn

e ______ anterior (ventral) horn

a (or b or c) ______ receives sensory input

b or d ______ sends motor output

f ______ posterior (dorsal) column

g ______ anterior (ventral) column

any letter ______ left side of brain (tricky…think about this)

any letter ______ right side of brain (tricky…think about this)
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4. Your friend tells you about a person who knew someone who had a cousin, Uta, that had a minor stroke. Uta was bilingual (English First language, Polish Second language) before the stroke. However, after the stroke she could no longer speak Polish even though she could still comprehend it if someone else spoke Polish. Her English speaking and comprehension were unaffected by the stroke. What language area did the stroke most-likely effect (e.g. global language areas, Broca’s area, Wernicke’s area)? Was Uta more likely a “late” bilingual learner (she learned Polish late in life) or an “early” bilingual learner and why. (2 points) For 0.5 pts extra credit name the artery most likely involved in the stroke.

  Broca’s area, Late bilingual learner, because learning a 2nd language late in life recruits some nonoverlapping areas than that used for the 1st language.
  middle cerebral artery superior division