MULTIPLE CHOICE

1. Many physical quantities are connected by *inverse square laws*, that is, by power functions of the form

$$f(x) = kx^{-2}.$$

   In particular, the illumination of an object by a light source is inversely proportional to the square of the distance from the source. Suppose that after dark you are in a room with just one lamp and you are trying to read a book. The light is too dim and so you move

$$\frac{1}{3}th$$

   the distance to the lamp. How much brighter is the light?

   a. $\dfrac{4}{9}$ times

   b. $\dfrac{9}{2}$ times

   c. 9 times

   d. $\dfrac{3}{2}$ times

   e. 9 times

   ANS: C   PTS: 1   DIF: Medium   REF: 1.2.25
   MSC: Bimodal   NOT: Section 1.2

2. Scientists have discovered that a linear relationship exists between the amount of flobberworm mucus secretions and the air temperature. When the temperature is 65°F, the flobberworms each secrete 16 grams of mucus a day; when the temperature is 95°F, they each secrete 22 grams of mucus a day. Find a function $M(t)$ that gives the amount of mucus secreted on a given day, where t is the temperature of that day in degrees Fahrenheit.

   a. $M(t) = 0.2t + 16$
   b. $M(t) = 5t + 16$
   c. $M(t) = 5t + 3$
   d. $M(t) = 0.2t + 3$

   ANS: D   PTS: 1   DIF: Medium   REF: 1.2.15a
   MSC: Bimodal   NOT: Section 1.2

3. The relationship between the Fahrenheit and Celsius temperature scales is given by the linear function.

$$F = \frac{9}{5}C + 32$$

What is the *F*-intercept and what does it represent?

a. $\frac{9}{5}$, Fahrenheit temperature corresponding to $0\,^{\circ}C$

b. $\frac{9}{5}$, Celsius temperature corresponding to $32\,^{\circ}C$

c. 32, Celsius temperature corresponding to $0\,^{\circ}F$

d. 0, Fahrenheit temperature corresponding to $32\,^{\circ}C$

e. 32, Fahrenheit temperature corresponding to $0\,^{\circ}C$

ANS: E   PTS: 1   DIF: Medium   REF: 1.2.13b
MSC: Bimodal   NOT: Section 1.2

4. The monthly cost of driving a car depends on the number of miles driven. Julia found that in October it cost her $200 to drive 300 mi and in July it cost her $350 to drive 600 mi. Express the monthly cost *C* as a function of the distance driven *d* assuming that a linear relationship gives a suitable model.

a. $C = -50d + 0.5$
b. $C = 50d - 0.5$
c. $C = 0.5d + 50$
d. $C = 2d + 50$
e. $C = 0.5d - 50$

ANS: C   PTS: 1   DIF: Medium   REF: 1.2.18a
MSC: Bimodal   NOT: Section 1.2

NUMERIC RESPONSE

1. It makes sense that the larger the area of a region, the larger the number of species that inhabit the region. Many ecologists have modeled the species-area relation with a power function and, in particular, the number of species *S* of bats living in caves in central Mexico has been related to the surface area *A* measured in m^2 of the caves by the equation

$$S = 0.7A^{0.3}$$

(a) The cave called mission impossible near puebla, mexico, has suface area of $A = 90\,m^2$. How many species of bats would expect to find in that cave?

(b) If you discover that 5 species of bats live in cave estimate the area of the cave.

ANS:
a) 3 species
b) $702\,m^2$

2. The relationship between the Fahrenheit and Celsius temperature scales is given by the linear function.

$$F = \frac{9}{5}C + 32$$

Complete the table and find the slope.

^{0}C	^{0}F
12	
−19	
slope	

ANS: $(12, 54)(-19, -66)$; slope $= 4$