1 (total points: 13). An appliance company that makes a brand of washing machines has monthly fixed costs of $600,000 and variable costs of $150 per washer. The company sells the washers for $225 each.

(a) (7 points). Find a formula for the monthly profit as a function of \( q \), the number of washers produced monthly.

(b) (6 points). Find the break-even point and use one sentence to explain the economic significance of your result.

2 (12 points). A $23,000 new bought car depreciates linearly down to a value of $10,000 in 10 years.

(a) (7 points). Find a formula for its value \( V \) as a function of time \( t \), number of years since its initial purchase.

(b) (5 points). How much is the car worth three years after its purchase?
3(total points: 13). The demand and supply curves for a certain product are given in terms of price, \( p \) dollars per unit, by

\[
D(p) = 2500 - 20p \quad \text{and} \quad S(p) = 10p - 500.
\]

(a)(5 points). Find the equilibrium price and quantity.

(b)(5 points). If a specific tax of $6 per unit is imposed on the producers, find the new equilibrium price and quantity.

(c)(3 points). How much of the $6 tax is payed by consumers and how much by the producers?

4(total points: 12). In each of the items (a)–(d), determine if the function is a power function. If it is a power function, write it in the form \( y = kx^p \) and give the values of the coefficient \( k \) and the exponent \( p \).

(a)(3 points). \( y = -\frac{1}{\sqrt{x}} \).

(b)(3 points). \( y = 2(3^x) \).

(c)(3 points). \( y = 5 + x^2 \).

(d)(3 points). \( y = (x^3)^2 \).
5(total points: 12). Solve the following equation for $t$. (You should use your calculator to find a decimal approximation.)

$$59(5^t) = 7^t.$$ 

6(total points: 13). According to Johnson and Matchett, in tallgrass prairies in Kansas the new root growth $y$ measured in germs per square meter as a function of $x$, the depth below the surface, measured in centimeters, can be approximated by $y = 192e^{-0.34x}$. Estimate the soil depth for which the root growth is one half of the amount at the surface.
7(total points: 12). The functions $f$ and $g$ are given by the following graphs.

(a)(6 points). Estimate $f(g(1))$.

(b)(6 points). Estimate $g(f(2))$.

8(total points: 13). Assume that accounts A and B both have annual interest rates (nominal rates) of 6%.

(a)(6 points). If the interest of account A is compounded quarterly, find its effective annual yield.

(b)(7 points). If the interest of the account B is compounded continuously and the account holder needs a balance of 40,000 dollars in 30 years after its opening. How much initial investment in the account is needed?