

Additional Progress Exercises Chapter 2

Additional Progress Exercises 2

(P.E. 2.2 means questions based on the same material as those in Progress Exercise 2.2)

P.E. 2.2 *Straight lines, Equations, Slopes and Intercepts*

1. Determine which of the following functions do not lie on the given line

(a) Points (Q, P) : $A = (10, 25)$, $B = (30, 20)$ and line $P = 30 - 0.5Q$

(b) Points (Q, TC) : $A = (5, 15)$, $B = (5, 20)$ and line $TC = 10 + 2Q$

2. Given equation of the line $10x - 2y = 10$

(a) plot the line $y = f(x)$

(b) plot the line $x = g(y)$

In each case write down the equation of the slope and intercepts. Give a verbal description of the slope and intercepts

P.E. 2.2 solutions

1. (a) B (b) A

2. (a) $y = 5x - 5$: For the graph, plot y vs. x : See Fig PE Q 2(a) M

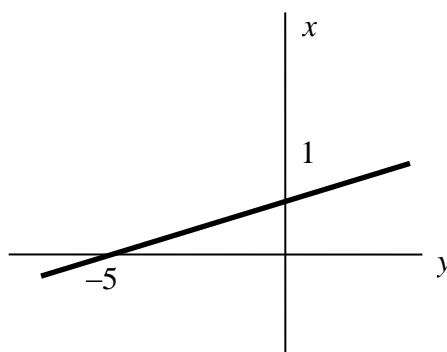
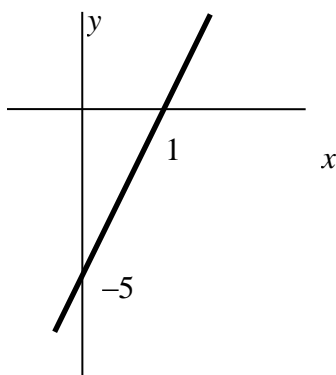
$$m = 5; y(0) = -5; x(0) = 1.$$

- (b) $x = 0.2y + 1$. For the graph plot x vs. y : see Figure PEQ2(b) M

$$m = 0.2; x(0) = 1 \text{ (vertical intercept)}; y(0) = -5 \text{ (horizontal intercept)}.$$

Note: the symbol $y(0)$ represents the vertical intercept when plotting y vs. x : it is the value of y when $x = 0$. Similarly, $x(0)$ represents the horizontal intercept when plotting y vs. x : it is the value of x when $y = 0$.

Comment: the intercepts are the values of one variable when the other variable is zero. The slope is the change in the vertical variable when the horizontal variable increases by one unit. So, in (a) y increases by 5 units when x increases by 1 unit. In (b) x increases by 0.2 units when y increases by one unit



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Figure PE 2.2 Q2(a)M

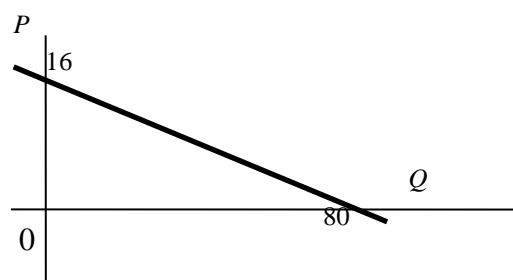
Figure PE 2.2 Q2(b)M

P.E 2.3: *Straight lines Demand and Supply*

1. Express the demand function: $Q = 80 - 5P$: the form, $P = g(Q)$.
 - (a) Plot the demand function expressed in the form $P = g(Q)$.
 - (b) What is the change in price (P) when quantity (Q) increases by 1 unit?
 - (c) What is the demand when $P = 0$?
 - (d) What is the price when $Q = 0$?Describe the answers to (b), (c) and (d) verbally.

Solutions P.E. 2.3

1. (a) $P = 16 - 0.2Q$



- (b) Price drops by 0.2 when the quantity demanded increases by 1 unit. This is the value of the slope. $\frac{\Delta P}{\Delta Q}$

- (c) When $P = 0$, $Q = 80$.

- (d) When $Q = 0$, $P = 16$.

Figure PE 2.3 Q1M

P.E. 2.4: *Cost, Revenue and Utility modelled by linear functions*

(Questions on Consumption and savings)

1. A consumption function is modelled by the equation, $C = C_0 + bY$.
 - (a) Given that autonomous consumption is 100 units and the $MPC = 0.75$, write down the equations for (i) the consumption function and (ii) the savings function.
 - (b) Define the term MPC . Write down the equation which expresses MPC in terms of changes in income and consumption.
 - (c) Calculate the change in consumption and savings when national income increases from £20m to £80m.
2. Given the savings function, $S = -20 + 0.2Y$ and that $Y = C + S$
 - (a) Write down the equation of the consumption function.
 - (b) What is the level of savings and consumption when $Y = £8m$.
 - (c) What is the level of national income when savings is £5m.
 - (d) Determine the range of incomes for which savings are positive.

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3. (See question 2) The savings function is, $S = -20 + 0.2Y$,
 (a) What is the value for the MPC ? Calculate the change in (i) consumption and (ii) savings when national income increases from £50m to £80m.
 (b) Plot the consumption and savings functions.

P.E. 2.4 solutions

1. (a) (i) $C = 100 + 0.75Y$ (ii) $S = Y - C = 0.25Y - 100$.
 (b) The marginal propensity to consume, MPC , measures the change in consumption expenditure per unit increase in income. $MPC = \frac{\Delta C}{\Delta Y}$.
 (c) When $\Delta Y = £80m - £20m = £60m$, then
 $\Delta C = MPC \times \Delta Y = 0.75 \times 60 = £45m$. and $\Delta S = MPS \times \Delta Y = 0.35 \times 60 = £15m$
 2. (a) $S = -20 + 0.2Y$ and $C = Y - S$, then $C = 20 + 0.8Y$.
 (b) When $Y = £50m$, $S = -£10m$, $C = £60m$.
 (c) When $S = £8m$, $Y = £140m$.
 (d) $S > 0$ when $Y > 100$.

3. (a) $MPC = 0.8$.

When $\Delta Y = £30m$, then,

(i) $\Delta C = MPC (\Delta Y) = 0.8 \times 30 = £24m$.

(ii) $\Delta S = MPS (\Delta Y) = 0.2 \times 30 = £6m$.

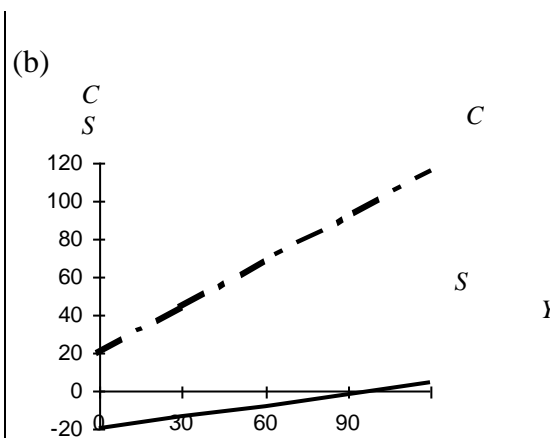


Figure PE 2.4 Q3(b)M

P.E. 2.5: The equation of a line from two points or one point and slope, with applications

1. For each of the following straight lines write down the slope and point of intersection with the vertical and horizontal axis, hence plot the graph.

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- (a) $4x - y + 10 = 0$, assuming $y = f(x)$.
 (b) $10P - 80 = Q$, assuming $Q = f(P)$.
 (c) $5P - 2Q + 10 = 0$, assuming $P = g(Q)$.
2. A line passes through the points (Q, P) : $(10, 15)$ and $(0, 5)$.
 (a) Calculate the slope of the line.
 (b) Determine the equation of the line in the form $P = a + bQ$
 (c) Calculate the intercepts, hence plot the line.

PE 2.5 Solutions

1 (a) $y = 4x + 10$: $m = 4$, $y(0) = 10$, $x(0) = -2.5$. See Figure PE2.5 Q2(a)M

1 (b) $Q = 10P - 80$: $m = 10$, $Q(0) = -80$, $P(0) = 8$. See Figure PE2.5 Q2(a)M

1 (c) $P = 0.4Q - 2$: $m = 0.4$, $P(0) = -2$, $Q(0) = 5$. See Figure PE2.5 Q2(a)M

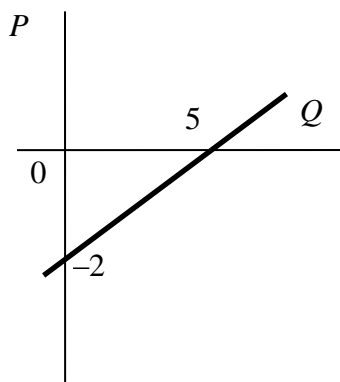
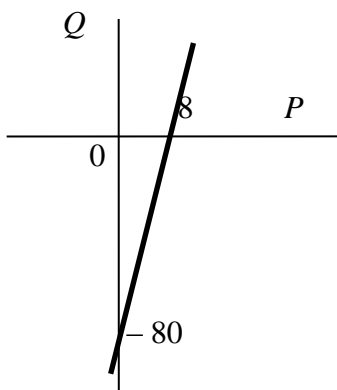
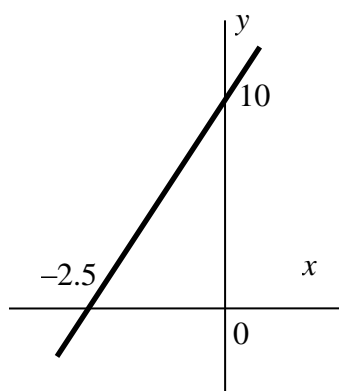


Figure PE2.5 Q1 (a)M

Figure PE2.5 Q1 (b)M

Figure PE2.5Q1 (c)M

2 (a) $m = 1$ (b) $P = 5 + Q$ (c) $P(0) = 5$; $Q(0) = -5$

Figure PE2.5 Q2M

