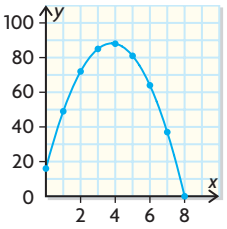
7. Answers may vary, e.g.,

a) 16 m

b) 8 s

c) Yes. The second differences are constant and non-zero.

d)



e) $y = -5x^2 + 38x + 16$

f) about 88 m

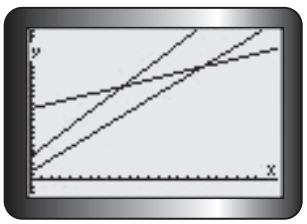
8. Answers may vary, e.g., in both cases, we try to find an equation that describes the relationship. Using a quadratic relation is generally more difficult because parabolas can be harder to match to data as they all have different shapes (narrower or wider openings). This gives more flexibility, however, and can be used to model a wider variety of relationships.

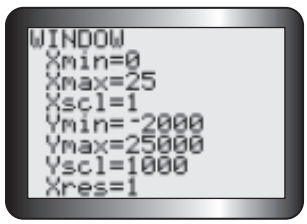
9. **a)** $\frac{1}{49}$ **b)** -1 **c)** $-\frac{81}{16}$ **d)** $-\frac{1}{125}$

Cumulative Review Chapters 1–3, page 189

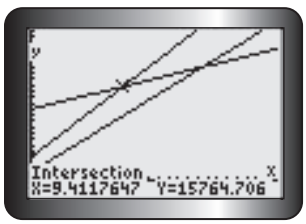
1.	C	**6.**	B	**11.**	B	**16.**	A	**21.**	D
2.	B	**7.**	A	**12.**	D	**17.**	B	**22.**	A
3.	A	**8.**	C	**13.**	A	**18.**	B	**23.**	B
4.	D	**9.**	D	**14.**	D	**19.**	C	**24.**	D
5.	C	**10.**	B	**15.**	B	**20.**	C		

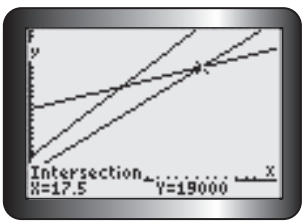
25. **a)** gas: $C = 4000 + 1250t$; electric: $C = 1500 + 1000t$; geothermal: $C = 12\,000 + 400t$





b)

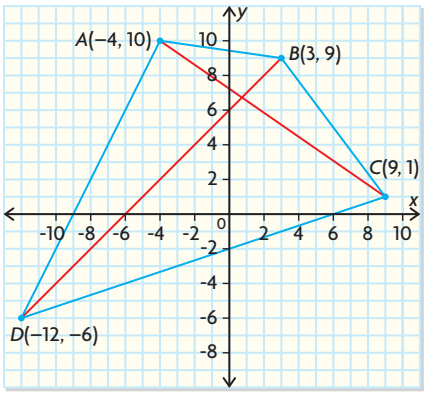




Electric baseboard heaters are the least expensive for the first 17.5 years. A gas furnace is more expensive than electric baseboard heaters, but it is less expensive than a geothermal heat pump for the first 9.4 years. After 17.5 years, the geothermal heat pump is the least expensive.

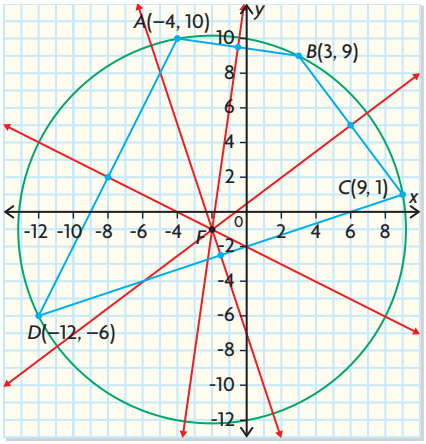
c) Answers may vary, e.g., The choice depends on how long Jenny and Oliver plan to live in the house. Another factor that they should consider is the uncertainty about gas and electricity prices over time. Geothermal costs will remain relatively stable.

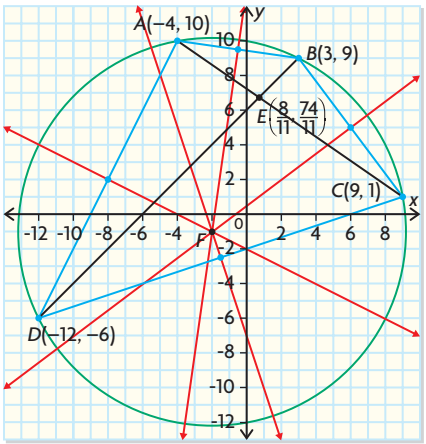
26. **a)**



Answers may vary, e.g., If all four perpendicular bisectors intersect at the same location, you can draw a circle that passes through all four vertices. The centre of this circle is the point of intersection of the perpendicular bisectors. Determine the equations of the perpendicular bisectors, and then solve the linear system that is formed by two of these equations. Check to see if the solution satisfies the other equations.

b) perpendicular bisector of AD: $y = -0.5x - 2$; perpendicular bisector of DC: $y = -3x - 7$; perpendicular bisector of CB: $y = 0.75x + 0.5$; perpendicular bisector of BA: $y = 7x + 13$ All four lines intersect at $(-2, -1)$, so it is possible to draw a circle that passes through all four vertices. Therefore, quadrilateral $ABCD$ is cyclic.





c) $E\left(\frac{8}{11}, \frac{74}{11}\right)$;

$AE = \frac{20\sqrt{10}}{11} \doteq 5.749\,595\,746$ units;

$EC = \frac{35\sqrt{10}}{11} \doteq 10.061\,792\,56$ units;

$BE = \frac{25\sqrt{2}}{11} \doteq 3.214\,121\,733$ units;

$ED = \frac{140\sqrt{2}}{11} \doteq 17.999\,081\,7$ units;

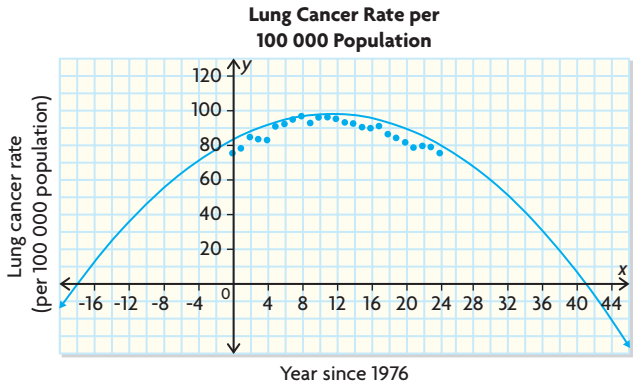
$AE \times EC = \frac{7000}{121} \doteq 57.851\,239\,7$ units;

$BE \times ED = \frac{7000}{121} \doteq 57.851\,239\,7$ units;

$AE \times EC = BE \times ED$, so AC and BD are chords of the same circle. This confirms that $ABCD$ is cyclic.

d) Any square, rectangle, or isosceles trapezoid is cyclic. Kites can be cyclic if and only if they have two right angles.

27. a)



b) Answers may vary, e.g., zeros may occur at $(-18, 0)$ and $(41, 0)$. Point $(17, 95)$ lies on the curve.

$$y = a(x + 18)(x - 41)$$
$$95 = a(17 + 18)(17 - 41)$$
$$95 = -840a$$
$$-\frac{95}{840} = a$$
$$-0.113\,095 \doteq a$$
$$y = -0.113\,095(x + 18)(x - 41)$$

c) regression equation of the curve of best fit: $y = -0.1358x^2 + 3.0681x + 77.3089$; equation of the curve of good fit: $y = -0.113\,095x^2 + 2.601\,185x + 83.464\,11$

d) If the trend continues, lung cancer rates in Canadian males will continue to decrease.

Chapter 4

Getting Started, page 194

1. **a)** i **b)** iv **c)** v **d)** vi **e)** vii **f)** iii **g)** ii **h)** viii

2. **a)** $-x + 2y$ **b)** $-9a^2 + 9b^2$ **c)** $4x - 4y + 4$ **d)** $-a - ab - 4b$

3. **a)** $14x - 35$ **b)** $-15x^3 + 20x^2 - 25x$ **c)** $-8x^2 + 12x + 2$ **d)** $d^2 - 4d - 12$ **e)** $12a^2 - 37ab + 21b^2$ **f)** $24x^3 + 24x^2 + 6x$

4. **a)** $4(2x + 5) = 8x + 20$

b) $2x(2x + 2) = 4x^2 + 4x$

c) $(x + 2)(3x + 2) = 3x^2 + 8x + 4$

d) $(x - 2)(3x + 2) = 3x^2 - 4x - 4$

5. **a)** x^{12} **b)** $-36a^7$ **c)** 6 **d)** $5z^4$

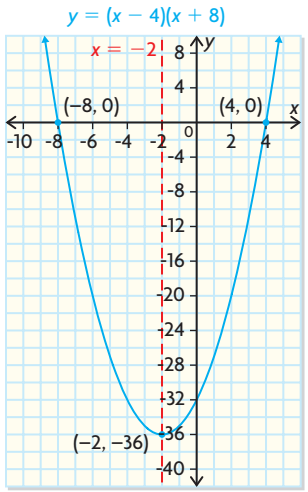
6. Answers may vary, e.g.,

a) $5x^3$ **b)** $4a + 6b$ **c)** $2x + 3y + 4$ **d)** $x^2 - 8x + 9$

7. **a)** 7 **b)** 9 **c)** 9 **d)** 4 **e)** 5 **f)** 6

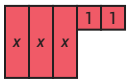
8. **a)** x-intercepts: 4, -8; equation of the axis of symmetry: $x = -2$; vertex: $(-2, -36)$

b)

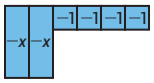


c) $y = x^2 + 4x - 32$

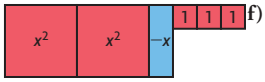
9. **a)**



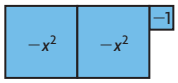
b)



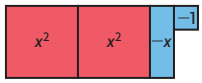
c)



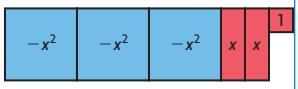
d)



e)

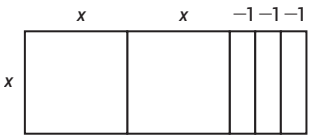


f)

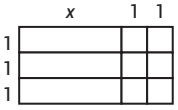


10. **a)** iii **b)** ii **c)** i

11. **a)**



b)



c)