Revision Packs for FM Algebra 2

1) For the following functions $f(x) = 3x - 5$ $g(x) = \frac{x-4}{7x}$ $h(x) = 2 - x^3$

Find:

a) $h(3)$ b) $g(2p^2)$ c) $fg(x)$ d) $hf(x)$ e) $f^{-1}(x)$

f) $g^{-1}(x)$

Solve:

g) $f(x+4) = 3$ h) $f(x) = g(x)$

i) Explain why solving $f(x) = f^{-1}(x)$ is the same as solving $f(x) = x$

2) Find the range of $f(x) = 3x - 7$ for $-2 < x \leq 4$

3) Find the vertex of $y = x^2 - 6x + 2$.

Hence find the range of $f(x) = x^2 - 6x + 2$ for $0 \leq x \leq 5$

4) For a function $f(x) = mx + c$, $-7 \leq f(x) < -1$ for $3 < x \leq 6$

Find m and c

5) Sketch the following function:

$$f(x) = \begin{matrix} 2x & for\ 0 \leq x \leq 3 \\ 6 & for\ 3 \leq x \leq 5 \\ -3x + 21 & for\ 5 \leq x \leq 7 \end{matrix}$$

6) $$f(x) = \begin{matrix} x + 4 & for\ 0 \leq x \leq 2 \\ ax + b & for\ 2 \leq x \leq 6 \end{matrix}$$

The area enclosed by $x = 0, x = 6, y = f(x)$ and the $x$ axis is 26.

Find a and b

7) Solve for $x$ $2x^4 + x^2 - 6 = 0$

8) Solve for $x, y, z$ $x + y + z = 4$

$3x - y + 2z = 15$

$2x + 3y - z = -9$

9a) Show that $x - 2$ is a factor of $6x^3 - 19x^2 + 9x + 10$

b) Hence solve $6x^3 - 19x^2 + 9x + 10 = 0$

10) If $2x - 1$ is a factor of $x^3 - x^2 + px - 4$, find p

11) Find the n$^{th}$ term of the following sequences:

a) -5, 1, 7, 13, … b) $a + b,\ 2a - 2b,\ 3a - 5b,\ 4a - 8b$, … c) 8, 10, 16, 26, 40, …

12) For sequence 11b, the 5$^{th}$ term is 19 and the 7$^{th}$ term is 25. Find $a$ and $b$

13) Prove that every term in sequence 11c must be positive

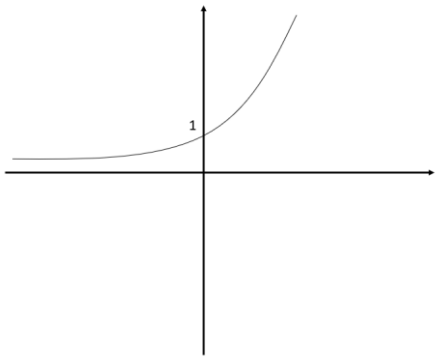
14) Find the equation of the line:

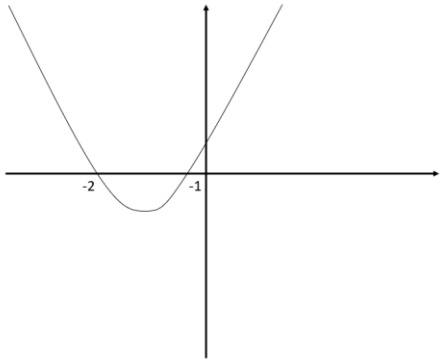
a) straight line with gradient = $\frac{2}{3}$ going through (6,1)

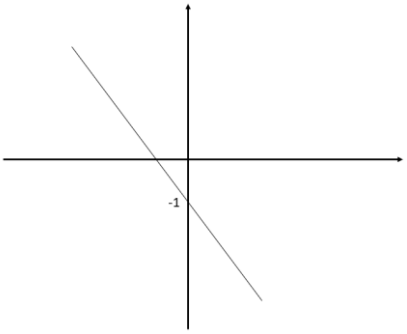
b) straight line passing through (3,2) and (5, -6)

c) a parabola with vertex (2,3) crossing the $y$ axis at 11

15) Below are given the sketch of 3 lines.




Match them to the following equations:

A $y = 2^x$ B $y = 7 - x^2$ C $y = x^2 + 3x + 2$

D $y = -x^3$ E $y = 3x - 1$ F $y = -\frac{1}{2}x - 1$

16) Solve for $x$

a) $x^4 - 3x^2 - 18$ b) $x = \sqrt{x} + 12$ c) $5^{2x} - 6 \times 5^x + 5 = 0$

17) Write down the set of values that satisfies both of the following inequalities:

$$3x - 1 \leq 5x - 8 \quad \text{and} \quad x^2 - 6x - 7 < 0$$

18) Write down the value of k such that $2 < x < 4$ are the values that satisfy the inequality $x^2 - 6x + k < 0$

19) Find the limiting values of the following sequences:

a) $u_n = \frac{5n-3}{3n+7}$ b) $u_n = \frac{2n+1}{4-9n}$

20) Prove that the sum of 2 consecutive odd squares is always even, but never a multiple of 4.

Answers

1a) -25 b) $\frac{p^2-2}{7p^2}$ c) $\frac{3x-12}{7x} - 5$ d) $2 - (3x - 5)^3$ or $-27x^3 + 135x^2 - 225x + 127$ e) $\frac{x+5}{3}$ f) $\frac{4}{7x-1}$ g) $-\frac{4}{3}$

h) 1.59, 0.119 i) $y = f^{-1}(x)$ is a reflection of $y = f(x)$ in the line $y = x$ so they meet each other when they meet $y = x$ 2) $-13 < f(x) \leq 5$ 3) vertex (3,-7) $-7 \leq f(x) \leq 2$ 4) $m = -2$ $c = 5$ 6) $a = -1$ $b = 8$ 7) $\pm\sqrt{\frac{3}{2}}$

8) $x = 1, y = -2, z = 5$ 9a) substitute $x = 2$ to find a result of 0 b) 2, $-\frac{1}{2}, \frac{5}{3}$ 10) $\frac{33}{4}$ 11a) $6n - 11$

b) $(a - 3b)n + 4b$ c) $2n^2 - 4n + 10$ 12) $a = 6$ $b = 1$ 13) rewrite nth term as $2(n-1)^2 + 8$, which has a minimum value of 8, so never turns negative 14a) $y = \frac{2}{3}x - 3$ b) $y = -4x + 14$ c) $y = 2x^2 - 8x + 11$

15) A C F 16a) $\pm\sqrt{6}$ b) 16 c) 0, 1 17) $\frac{7}{2} \leq x < 7$ 18) 8 19a) $\frac{5}{3}$ b) $-\frac{2}{9}$

20) $(2n + 1)^2 + (2n + 3)^2 = 8n^2 + 20n + 10 = 2(4n^2 + 10n + 5) = 4(2n^2 + 5n + 2) + 2$ so always 2 more than a multiple of 4.