(12) $f(x) = \dfrac{-10x}{2x^3 + x^2 + 1}$ → Deg top = 1, Deg bottom = 3 } top < bottom

→ H.A. $\boxed{y = 0}$

Short Answer:

(13) Distance $(0, -1)$ and $(8, -1)$

$$D = \sqrt{(8-0)^2 + (-1-(-1))^2}$$

$$D = \sqrt{64} = 8$$

(14) $x^2 + y^2 - 4x - 8y + 11 = 0$ → general form of circle.

Step 1: Complete the Square to convert to Standard Form.

$$\underbrace{x^2 - 4x + 4}_{(x-2)^2} + \underbrace{y^2 - 8y + 16}_{(x-4)^2} = -11 + 20$$

$(x-2)^2 + (x-4)^2 = 9$. → Standard Form

Step 2: Center, Radius. $\boxed{\begin{array}{l}\text{Center} = (2, 4) \\ \text{Radius} = 3.\end{array}}$

(15)

$$f(x) = \left(x-(-5)\right)(x-0)\left(x-\frac{1}{2}\right)$$

$$= (x+5)\cdot x\cdot\left(x-\frac{1}{2}\right)$$

$$= (x^2+5x)\left(x-\frac{1}{2}\right)$$

$$= x^3 - \frac{1}{2}x^2 + 5x^2 - \frac{5}{2}x$$

$$\boxed{f(x) = x^3 + \frac{9}{2}x^2 - \frac{5}{2}x}$$

(16) Domain of $f(x) = \dfrac{x-4}{x^2+7}$

Set Denom $= 0 \rightarrow x^2 + 7 = 0$

$\rightarrow x^2 = -7 \rightarrow x = \pm i\sqrt{7}$.

Since the denominator equals 0 when x is imaginary, the domain is all real numbers.

Answer: Domain $= \boxed{(-\infty, \infty)}$

(17) $h(x) = \dfrac{8x^3}{2x^2+1}$ → Deg top = 3 → Deg bottom = 2

Deg top > Deg bottom → **NO H.A.**

(18) $f(x) = \dfrac{x-9}{x^2+5}$

Cannot factor → set denom $x^2+5=0$

→ $x^2 = -5$ → $x = \pm i\sqrt{5}$

Since the solutions are imaginary numbers, there are no V.A.

Answer: **No V.A.**

Essay:

(19) Step 1: Synthetic Division:

	1	-2	-11	52
-4		-4	24	-52
	1	-6	13	0

Step 2: Set quotient = 0 and solve.

$$x^2 - 6x + 13 = 0$$

Cannot factor → Quadratic Formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$a = 1$; $b = -6$, $c = 13$

$$x = \frac{6 \pm \sqrt{36 - 4 \cdot 1 \cdot 13}}{2}$$

$$x = \frac{6 \pm \sqrt{-16}}{2} = \frac{6 \pm 4i}{2} = \frac{2(3 \pm 2i)}{2}$$

$$x = 3 \pm 2i$$

→ Solution set: $\{-4, 3+2i, 3-2i\}$

(20) $x^2 - 6x + 9 + y^2 + 6y + 9 = -7 + 18$

$$(x-3)^2 + (y+3)^2 = 11$$

Center: $(3, -3)$; Radius: $\sqrt{11}$