warm-up:

① Give a degree 3 poly. with zeros $-1, 3, 7$ that passes through $(0,5)$

$$f(x) = Ax^3 + Bx^2 + Cx + D$$

$$= A(x-(-1))(x-3)(x-7) = A(x+1)(x^2-10x+21)$$

$$= A(x^3 - 10x^2 + 21x + x^2 - 10x + 21)$$

$$= A(x^3 - 9x^2 + 11x + 21)$$

$$= \tfrac{5}{21}(x^3 - 9x^2 + 11x + 21)$$

Also
$$f(0) = 5$$
$$= A(0^3 - 0^2 + 0 + 21)$$
$$= 21A$$
$$A = 5/21$$

② Give a rational function that has:

- Horizontal Asy @ $y = 3$
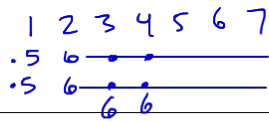
- Vertical Asymptotes @ $x = 5, x = -2$

$\boxed{Q}$ Can you give lots more examples w/ same criteria?

$$\frac{3}{1 \cdot (x-5)(x+2)}$$

← has specified V. Asy but Horiz Asy is $y = 0$

$$\frac{3x^2 + x}{(x-5)(x+2)}$$

Something like this will appear on subsequent exams

1. Simplify the expression:

(a) $4x^3(2x^0)^{-4}$ = $4x^3 \cdot \frac{1}{24}$ = $4 \cdot \frac{x^3}{16}$ = $\frac{x^3}{4}$

$(2 \cdot 1)^{-4}$

$2^{-4} = \frac{1}{24}$

$3^2 \cdot x^{-2}$
$3 \cdot 3 \cdot x^{-1} x^{-1}$

(b) $\dfrac{(3x^{-1})^2 y^4 z^8}{3xy^7 z^0}$ = $3x^{-1} \cdot 3x^{-1}$

$\dfrac{3^2 x^{-2} z^8}{3x \, y^7 \cdot y^{-4}}$ = $\dfrac{3 z^8}{x^3 y^3}$

2. Completely factor the polynomial:

(a) $\underline{x^3 - 5x^2 - 9x + 45}$

$x^2(x-5) - 9(x-5)$

$(x^2 - 9)(x-5)$

$(x-3)(x+3)(x-5)$

AC: $3(-8)$ (b) $3x^2 - 10x - 8$
$= -24$

$1, 2, 7, 4, 6, 12, 24$ $3x^2 - 12x + 2x - 8$

$3x(x-4) + 2(x-4)$

$(3x + 2)(x - 4)$

3. Find all solutions to the equations:

(a) $x^4 - 8x^2 + 16 = 0$

set: $w = x^2$

so $w^2 = x^4$

Sub: $w^2 - 8w + 16 = (w-4)^2 = 0$

$$w = 4$$

back
sub $x^2 = 4$ $\boxed{x = \pm 2}$

(b) $\left(\sqrt[3]{x-7} + 4 \right) = 0$

wrong $\downarrow$

$$\overset{3}{X-7} + 4^{3}$$

RIGHT   Isolate radical

$$\sqrt[3]{x-7} = -4$$

$$x - 7 = -64$$

$$\boxed{x = -57}$$

(c) $x - 4 = \sqrt{2x}$

$(x-4)^2 = 2x$

$x^2 - 8x + 16 = 2x$

$x^2 - 10x + 16 = 0$

$(x-8)(x-2) = 0$

$\begin{cases} x = 8 \\ \cancel{x = 2} \end{cases}$

4. Find the Domain of the functions:

↳ set of allowable inputs

(a) $f(x) = 5x^2 + 19x - 12$

— poly —

$\mathbb{R}$

(b) $g(x) = \sqrt{6 - x}$

$6 - x \geq 0$

$\boxed{(-\infty, 6]}$

$\boxed{6 \geq x}$

(c) $q(x) = \dfrac{3x}{9x^2 - 81}$

$\mathbb{R} - \{\pm 3\}$

$\left(\text{can't} \div \text{by } 0 \right.$

$9x^2 - 81 = 0 \qquad 9(x^2 - 9) = 0$

$x^2 - 9 = 0 \qquad x = \pm 3$

5. Find the following composition of:

$$f(x) = 2x + 6$$
$$g(x) = x^2 - 3x + 12$$

(a) Find the function $g \circ f$

(b) Find the function $f \circ f$

6. Write an equation for the line that satisfies the following characteristics:

(a) passes through points $(-3, -2)$ and $(6, 10)$

(b) passes through the point $(5, -2)$ and has an undefined slope

vertical line
(all x's are constant

$x = 5$

(c) passes through $(8, -1)$ and perpendicular to $6x - 3y - 5 = 0$

↓ extract slope

$6x - 5 = 3y$

$= y$

7. Find the inverse of the following functions:

(a) $f(x) = \sqrt{2x - 13}$

(b) $f(x) = \dfrac{4x - 3}{-x + 5}$