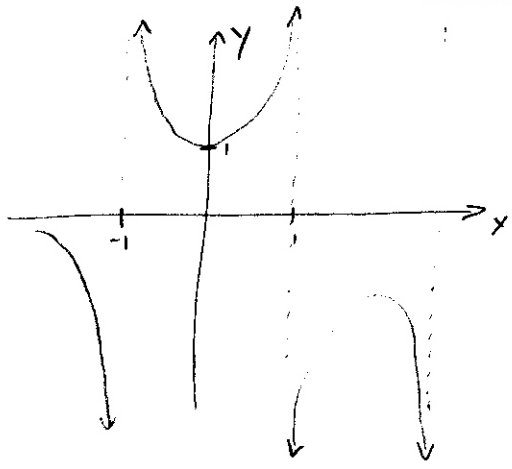
SECTION 1.3 PART II 28/35/45/50/51/56 29 AUG 08

LESSON 6 NEW FUNCTIONS FROM OLD

(28) SKETCH $\frac{1}{f(x)}$. WHICH FEATURES ARE MOST IMPORTANT?



MOST IMPORTANT FEATURES ARE THE X-INTERCEPTS BECAUSE THE DEFINE THE ASSYMPTOTES, AND THE MAX. AND MIN. OF $f(x)$ BECAUSE THE GRAPH OF $\frac{1}{f(x)}$ APPROACHES THE X-AXIS OR GETS LARGE

35) $f(x) = x + \frac{1}{x}$ $g(x) = \frac{x+1}{x+2}$

(a) $(f \circ g)(x) = \frac{x+1}{x+2} + \frac{1}{\frac{x+1}{x+2}} = \frac{x+1}{x+2} + \frac{x+2}{x+1}$

$$= \frac{(x+1)(x+1)}{(x+2)(x+1)} + \frac{(x+2)(x+2)}{(x+1)(x+2)}$$

$$= \frac{x^2+2x+1}{(x+2)(x+1)} + \frac{x^2+4x+4}{(x+1)(x+2)}$$

(a)

$$= \boxed{\frac{2x+6x+5}{(x+2)(x+1)} \quad D = \{x \mid x \neq -2, -1\}}$$

(b) $(g \circ f)(x) = \frac{(x+\frac{1}{x})+1}{(x+\frac{1}{x})+2} = \frac{\frac{x^2+1+x}{x}}{\frac{x^2+1+2x}{x}} = \frac{x^2+x+1}{x} \cdot \frac{x}{x^2+2x+1} = \frac{x^2+x+1}{x^2+2x+1}$

b

$$= \boxed{\frac{x^2+x+1}{(x+1)^2} \quad D = \{x \mid x \neq -1, 0\}}$$

35) ⓒ $(f \circ f)(x) = \left(x + \frac{1}{x}\right) + \frac{1}{x + \frac{1}{x}} = x + \frac{1}{x} + \frac{1}{\frac{x^2+1}{x}} = x + \frac{1}{x} + \frac{x}{x^2+1}$

$$= \frac{x(x)(x^2+1) + 1(x^2+1) + x(x)}{x(x^2+1)}$$

$$= \frac{x^4 + x^2 + x^2 + 1 + x^2}{x(x^2+1)}$$

$$\boxed{= \frac{x^4 + 3x^2 + 1}{x(x^2+1)}, \quad D = \{x \mid x \neq 0\}}$$

ⓓ $(g \circ g)(x) = \dfrac{\frac{x+1}{x+2} + 1}{\frac{x+1}{x+2} + 2} = \dfrac{\frac{x+1+x+2}{x+2}}{\frac{x+1+2(x+2)}{x+2}} = \dfrac{2x+3}{x+2} \cdot \dfrac{x+2}{3x+5}$

$$= \boxed{\frac{2x+3}{3x+5} \quad D = \{x \mid x \neq -2, -\tfrac{5}{3}\}}$$

45) EXPRESS $u(t) = \sqrt{\cos t}$ IN THE FORM $(f \circ g)(t)$

$$\boxed{\begin{array}{ll} f(t) = \sqrt{t} & \\ g(t) = \cos t & (f \circ g)(t) = \sqrt{\cos t} \end{array}}$$

50) ⓐ $f(g(1)) = \boxed{5}$ ⓑ $g(f(1)) = \boxed{2}$ ⓒ $f(f(1)) = \boxed{4}$

ⓓ $g(g(1)) = \boxed{3}$ ⓔ $(g \circ f)(3) = \boxed{1}$ ⓕ $(f \circ g)(6) = \boxed{4}$

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51) ⓐ $f(g(2)) = f(5) = \boxed{4}$

ⓑ $g(f(0)) = g(0) = \boxed{3}$

ⓒ $(f \circ g)(0) = f(3) = \boxed{0}$

ⓓ $(g \circ f)(6) = g(6) = \boxed{\text{UNDEFINED}}$

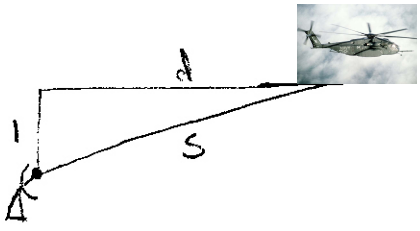
g IS UNDEFINED AT $x = 6$

ⓔ $(g \circ g)(-2) = g(1) = \boxed{3}$

ⓕ $(f \circ f)(4) = f(2) = \boxed{-2}$

56) ⓐ $d = rt \Rightarrow \boxed{d(t) = 350t}$

ⓑ



$s^2 = d^2 + 1^2$

$s = \sqrt{d^2 + 1}$

$\boxed{s(d) = \sqrt{d^2 + 1}}$

ⓒ $\boxed{(s \circ d)(t) = \sqrt{(350t)^2 + 1}}$