

# HOMEWORK: 3/21 MATH 122

1

a)  $x \mapsto \frac{1}{3}(x-7)$

Domain:  $-23 \leq x \leq 22$

Codomain:  $-10 \leq y \leq 5$

• Write  $y = f(x)$   
• Solve for  $x$ , so that  $x$  is in domain of  $f$   
• Swap  $y \leftrightarrow x$

b)  $x \mapsto \sqrt[3]{\frac{1}{5}(x+1)}$

Domain:  $-\infty < x < \infty$

Codomain:  $-\infty < y < \infty$

c)  $x \mapsto -\sqrt{\frac{1}{3}(\pi-x)}$

Domain:  $\pi-12 < x < \pi-3$

Codomain:  $-2 < y < -1$

d)  $x \mapsto \frac{1}{9}\left(2 - \frac{10}{x}\right)$

Domain:  $-\frac{10}{7} < x < -\frac{10}{43}$

Codomain:  $1 < y < 5$

e)  $x \mapsto \frac{3}{2} + \frac{1}{2x} + \frac{\sqrt{x^2-6x+1}}{2x}$

Domain:  $x > 0$

Codomain:  $y > 2$

②

2) If we choose  $a, b$  so that

$$x^2 + ax + b = (x+1)(x-c),$$

for some  $c$ ,  $|c| > 2$ , then

$$f(x) = \frac{x+1}{(x+1)(x-c)}$$

$$= \frac{1}{x-c}$$

will be strictly decreasing for  $|x| < 2$ :

indeed

$$f'(x) = \frac{-1}{(x-c)^2} < 0$$

Take  $a=10$   $b=9$ . Then,

$$x^2 + 10x + 9 = (x+1)(x+9)$$

3a) F :  $f(x) = x$   
 $g(x) = -x$

③

b) F :  $f(x) = -x$

c) T

d) F : eg.  $x^3 - 3x + 1$  has 2  
critical points at  $x = \pm 1$

