

## Math Relays 2016

### Functions

#### No Calculators Are Allowed on this Test

For problems 1-5 use these functions  $f(x) = 1 + \frac{1}{x}$  and  $g(x) = x + \frac{1}{x}$ . Choose your answer from the list:

(a)  $1 + \frac{1}{x + \frac{1}{x}}$  (b)  $\frac{x+1}{x} + \frac{x}{x+1}$  (c)  $\frac{x^2+1}{x+1}$  (d)  $\frac{x^2+x+2}{x}$  (e) none of these

1.  $\frac{g}{f}(x) =$

2.  $(f + g)(x) =$

3.  $f(g(x)) =$

4.  $g(f(x)) =$

5.  $(g - f)(x) =$

For problems 6-10 choose your answer from the list:

(a)  $(0, \infty)$  (b)  $(-\infty, \infty)$  (c)  $y \neq 2$  (d)  $x \neq 1$  (e) none of these

6. the domain of  $f(x) = \frac{x^2-1}{x-1}$  is

7. the domain of  $g(x) = \frac{1}{\sqrt{|x-1|}}$  is

8. the range of  $g(x) = \frac{1}{\sqrt{|x-1|}}$  is

9. the range of  $f(x) = \frac{x^2-1}{x-1}$  is

10. the range of  $h(x) = 2^{-x}$  is

For problems 11-15 use  $f(x) = x - 2x^2 - 3$ . Choose your answer from the list:

(a) 5 (b)  $5 - 2h$  (c)  $5h - 2h^2 - 6$  (d)  $-5h - 2h^2 - 6$  (e) none of these

11.  $f(-1) =$

12.  $f(-1 + h) =$

13.  $\frac{f(-1+h)-f(-1)}{h} =$

14.  $f(-1 + h) - f(-1 - h) =$

15.  $\frac{f(-1+h)-f(-1-h)}{2h} =$

For problems 16-20 choose the name of the function for your answer from the list:

(a) quadratic (b) linear (c) exponential (d) trigonometric (e) none of these

16.  $4^{\log_2 x}$

17.  $\frac{x^{2016} - 1}{x^{2015} + x^{2014} + \dots + x + 1}$

18.  $[\tan^{-1}(\ln e^{\tan x})]^2 + 1$

19.  $\ln(2^{\cos x + \sin x})$

20.  $e^{ix} + e^{-ix}$