

NAME:

[11] Let  $f$  &  $g$ , be functions, and  $x$  &  $y$  be real numbers.

T F  $(fg)(x) = (gf)(x)$

T F  $(\frac{f}{g})(x) = (\frac{g}{f})(x)$

T F  $x^2 = y$  defines  $x$  as a function of  $y$

T F  $x - 2$  is a factor of  $\frac{1}{2}x^4 - 2x^2 + x - 2$

T F  $\log(\log(e)) = 0$ .

T F The diameter of a circle varies directly with the radius.

Right answers will *not* get credit without supporting work. Note "undefined" and "no solution" are possible answers.

1. [2] Define  $\log x = y$

2. [2] Which of the following may be a graph of a polynomial of degree five with a positive leading coefficient?

3. [2] Which of the following is a graph of an even function?

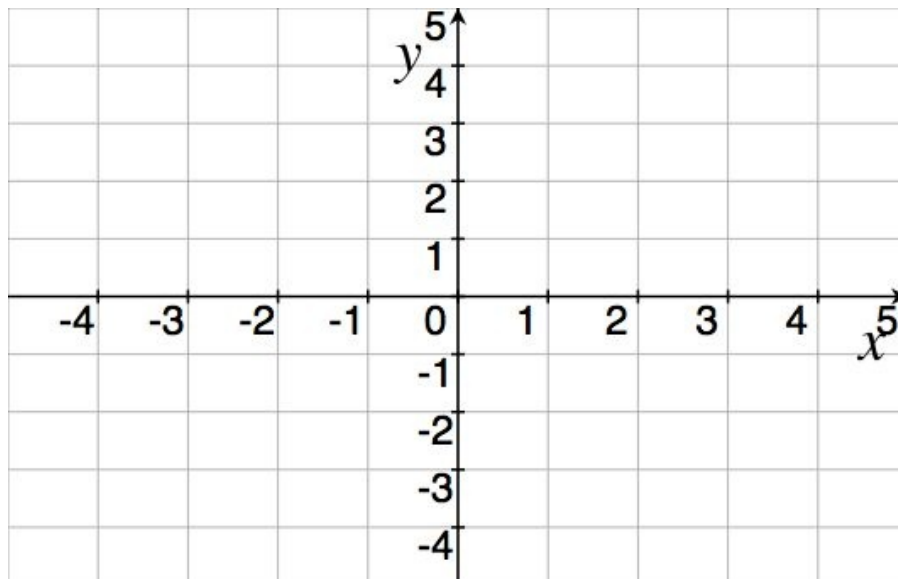
4. [3] If  $f(x)$  is an even function,  $f(2) = 6$ , and  $g(x) = \frac{1}{2}f(2x) - \frac{1}{3}$ , what is  $g(-1)$ ?
5. [3] Find the equation for a line that perpendicular to the line with end points  $(51, 60)$  and  $(53, 50)$ .
6. [3] Given  $kx^2 + 5x - 2 = 0$ , what does  $k$  have to be to ensure 2 real solutions? Give answer in interval notation?
7. [3] Let  $g$  be the function defined by the rule  $g(x) = |x^2 + 3x - 6|$ . Find  $x$  such that  $g(x) = 2x$ .

8. Given  $f(x) = \frac{1}{1-x} - 2$ :

- [5] Compute the difference quotient. Recall the difference quotient is:

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

- [2] List the transformations needed to transform the graph of  $h(x) = \frac{1}{x}$  into the graph of  $f$ . Graph both  $h$  and  $f$ . Be sure to identify which one is which.



- [2] Algebraically find the inverse of  $f(x)$ .

9. [15] Let  $f(x) = \sqrt{7x - 3}$ , and  $g(x) = 3x - 7$ . Find the following, and specify the domain in interval notation of each one.

(a) [3]  $(fg)(x)$

(b) [4]  $\left(\frac{f}{g}\right)(x)$

(c) [4]  $\left(\frac{g}{f}\right)(x)$

(d) [4]  $f(g(x))$

10. Simplify:

$$\frac{\sqrt{c^2 d^6}}{\sqrt{4c^3 d^{-4}}}$$

$$\log_2 \frac{1}{4}$$

11. [7] Given  $f(3) = 0$ , use the factor theorem to find the other roots of  $x^4 - 3x^3 - 25x^2 + 75x$

12. [3] Simplify:

$$\frac{(x^2)^{\frac{1}{3}}(8y^2)^{\frac{2}{3}}}{4x^{\frac{2}{3}}y^2}$$

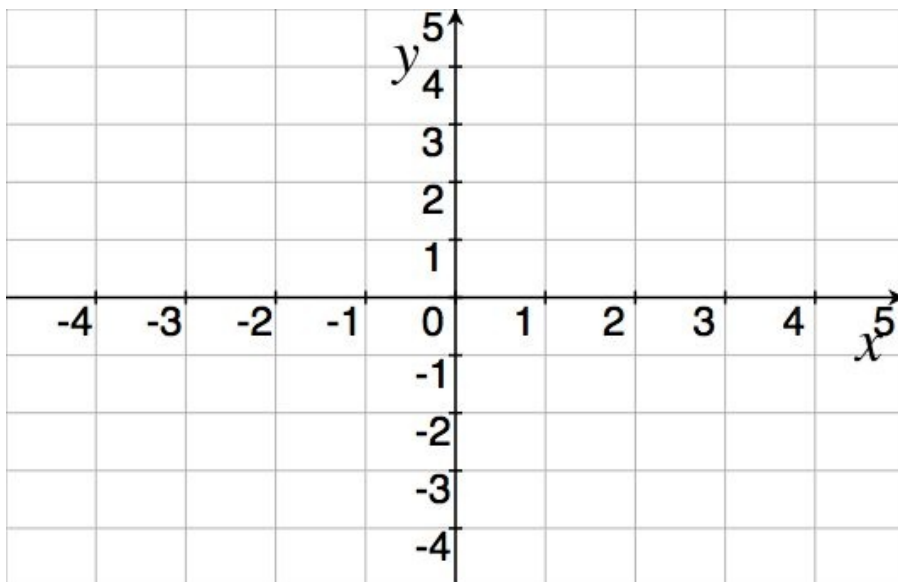
$$2 - \log_5(25z)$$

13. [4] Solve for  $x$ :

$$\log(x - 16) = 2 - \log(x - 1)$$

$$4^x - 3 \cdot 2^x = 10$$

14. [4] List the transformations needed to transform the graph of  $h(x) = \log_2 x$  into the graph of  $f(x) = \frac{1}{2} \log_2(x + 3) + 1$ . Graph both  $h$  and  $f$ . Be sure to identify which one is which.



15. [4] You are given a 16 oz mocha that is a rather weak 3% espresso. You, knowing you'll be up late studying mathematics, would rather like a 30% espresso drink. Realizing this you purchase an espresso machine. How much weak mocha do you discard and replace with straight espresso to have a 16 oz mocha with the desired concentration?

16. [2] How long will a loan take to triple at 20% interest compounded quarterly?

17. [2] A potter can sell 120 bowls per week at \$5 per bowl. For each 50 cent decrease in price, 20 more bowls are sold. What price should be charged to maximize sales income?

18. [10] Graph and answer the following for

$$f(x) = \frac{(x - 2)(x^2 + 3x - 10)}{x^2 - 5x + 6}$$

(a) [3] Domain: (Give answers in interval notation)

(b) [2] Vertical Asymptotes:

(c) [1] Horizontal Asymptotes:

(d) [2] X-Intercepts:

(e) [1] Y-Intercept:

(f) [2] Holes: (Just the  $x$ -coordinate will suffice.)