

NAME: This is a sample final to be used for practice. This is *not a template* for the Final that will be given in class. Many of the questions on the Final will look quite different than those appearing here.

[10] Let f & g , be functions.

T F $(f \circ g)(x) = (g \circ f)(x)$

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

T F $\sqrt{(x^2)} = x$ for all real numbers x .

T F If $h(x) = x^2 + 1$, then h is an even function.

T F $\ln \frac{x}{y} = \ln x - \ln y$ for all non-negative numbers x and y .

T F $\log(\log(10)) = 0$.

T F Just as every integer is either even or odd, every function is either an even function or odd function.

T F $\sin(\frac{\pi}{3} + x) = \sin \frac{\pi}{3} + x$

T F If $\sin \theta > 0$ and $\tan \theta < 0$, then $\cos \theta < 0$

T F The range of \sin^{-1} is $[0, \pi]$

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

1. Find all x such that

$$5x^{-2} - 7 = 0$$

2. [2] Explain what a function is.

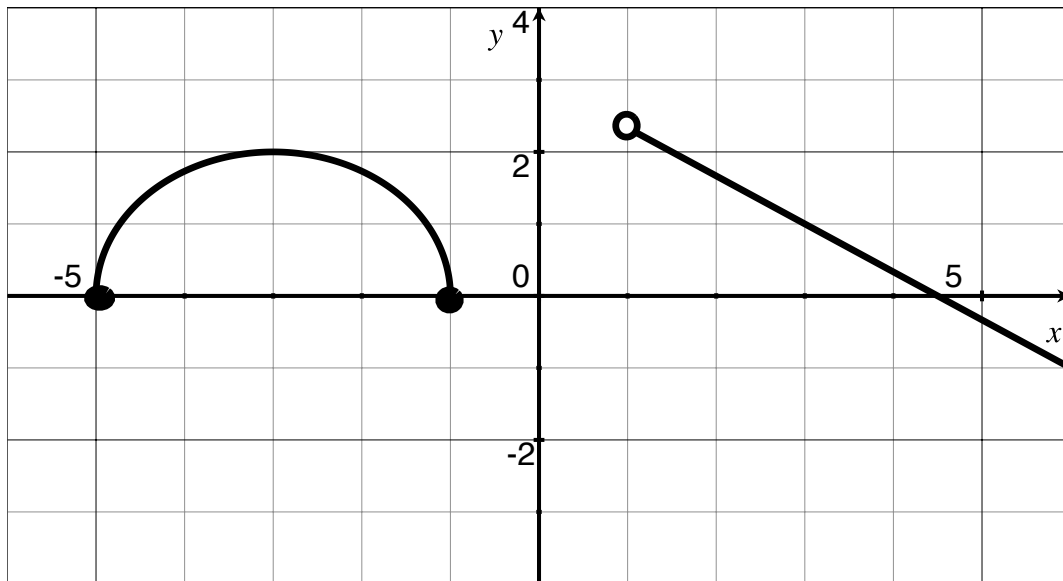
3. Given $m(x) = x^2 - 5x$, and $n(x) = \sqrt{4x - 8}$,

(a) [4] If $p(x) = 3m(x + 1)$, find the domain and rule of p .

(b) [3] Find the domain and rule of $n \circ m$.

(c) [5] Find the domain and rule of $\frac{n}{m}$.

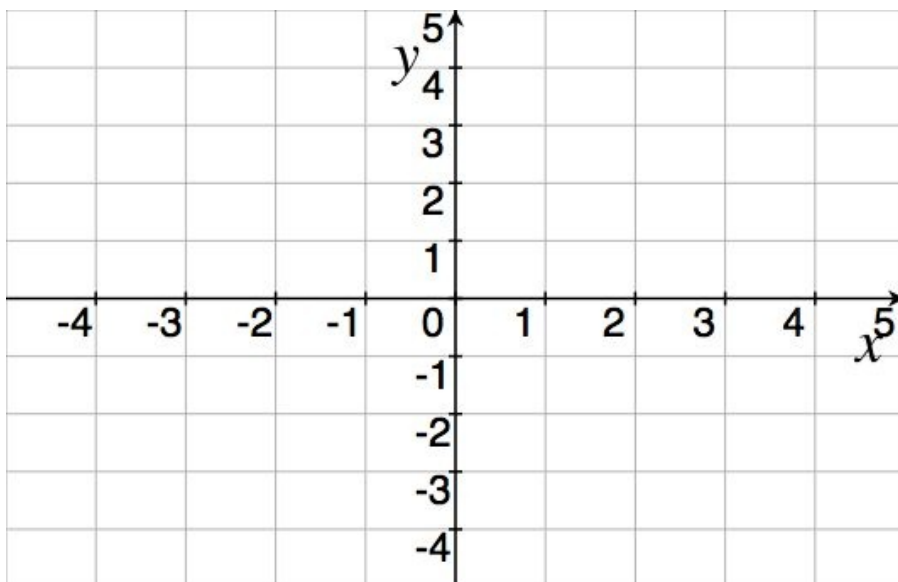
4. [3] Let the following be the graph of g .



- (a) What is the domain of g ?
- (b) The function g is a piecewise defined function consisting of a straight line and a semicircle. Write down the rule for g .
- (c) Find the exact x value(s) so that $g(x) = 2$?
- (d) Find the equation for a line that is perpendicular to the line with endpoints $(3, 1)$ and $(6, -1)$. (There are many right answers.)

5. Define f by

$$f(x) = \begin{cases} \tan x & \text{if } x < 0 \\ x^2 + 1 & \text{if } 0 < x \leq 2 \\ 2^{x-1} & \text{if } x \geq 2 \end{cases}$$



(a) [8] Graph f on the axes above.

(b) [9] Find the following if possible:

$$f(1)$$

$$f(2) + f(3)$$

$$f(0)$$

$$f\left(\frac{-13\pi}{4}\right)$$

Range of f

6. [3] If $f(x)$ is an even function, $f(2) = 6$, and $g(x) = \frac{1}{2}f(2x) - \frac{1}{3}$, what is $g(-1)$?

7. [6] Assuming that $\log_3 x = 5.3$ and $\log_3 y = 2.1$ find the following exactly:

$$\log_3 \frac{27x^3}{y^2} \qquad \log_9 3x$$

8. [4] Find all exact values for x that satisfy the following:

$$\log(x - 16) = 2 - \log(x - 1) \qquad 3^{5x}9^x = 27$$

9. Simplify:

$$\frac{\sqrt{c^2d^6}}{\sqrt{4c^3d^{-4}}} \qquad \log_2 \frac{1}{4}$$

10. Simplify:

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

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

$$\sin^{-1}\left(\sin \frac{3\pi}{4}\right)$$

$$\frac{\cos x}{1 - \sin x} + \frac{1 - \sin x}{\cos x}$$

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

12. [5] 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?
13. [5] Use the conventions from the book and class and let A be measure of the angle opposite the side with length a . Given that $a = 10\sqrt{2}$, $b = 20$, and $A = \frac{\pi}{6}$ with the standard notation, determine if the information describes 0, 1, or 2 triangles and solve for them/it if they/it exist/s.

14. [5] Suppose a radioactive isotope is such that one-fifth of the atoms in a sample decay after three years. Find the half-life of this isotope

15. [5] The force of friction is sometimes calculated by multiplying the normal force (the force holding the object up) by the mass of the object and by a 'coefficient of friction'. The coefficient of friction is a dimensionless number that depends on the two surfaces being pressed together.

A 10kg block is sliding down a dry glass ramp with angle of elevation of 60° and with a coefficient of friction of .94. Find the force of friction acting on the block.