

NAME _____

1. Let $f_1(x) = x$, $f_2(x) = 1/x$, $f_3(x) = 1 - x$, $f_4(x) = 1/(1 - x)$, $f_5(x) = (x - 1)/x$, $f_6(x) = x/(x - 1)$. Show that the composition of any two functions in the list is again in the list.
2. Let $f(x) = 1 - (x - 1)^2$ for $0 \leq x \leq 2$. Sketch $f(x)$. Now sketch $1 - f(x + 1)$. I would use shifting, but there are other ways to do this.
3. Given $O = (0, 0)$, $A = (a, 0)$, $B = (0, b)$ as the vertices of the triangle OAB , find the slope of the line OP if P is the midpoint of the side AB .

4. Find all x satisfying

$$\frac{x - 1}{x - 2} \leq \frac{x + 1}{x + 2}.$$

5. Prove that the area of any triangle is equal to half the product of any two sides and the sine of the included angle.
6. Let the equation of a semicircle be $y = \sqrt{r^2 - x^2}$, A the point $(r, 0)$, B the point $(-r, 0)$, and $C = (c, d)$ any point on the semicircle. Show that the angle $\angle ACB$ is a right angle. Hint: one way to do this is to show that the slopes of two lines are negative reciprocals.
7. A wall is k metres high and a second wall, higher than the first, is m metres behind the first one. A ladder must have one end on the ground, pass over the first wall, and reach the second. Express the length of the ladder as a function of the angle that it makes with the ground.
8. (For experts) Show that the area of a triangle with sides of lengths a, b, c is

$$\sqrt{s(s - a)(s - b)(s - c)}$$

where $s = (a + b + c)/2$ is the semiperimeter of the triangle.