1. Suppose $f(x) = x^2$ for all real numbers $x$, and $h$ is a real number. Mark each equation (T)rue or (F)alse.

$$f(x + h) = x^2 \cdot (x + h)$$  (1)
$$f(x + h) = x^2 + h$$  (2)
$$f(x + h) = (x + h)^2$$  (3)
$$f(x + h) = f(x + h)^2$$  (4)

2. Mark each identity true or false.

$$\cos 3x = 3x \cdot \cos$$  (5)
$$\cos 3x = 3 \cos x$$  (6)
$$\sin 2x = 2 \sin x \cos x$$  (7)
$$\cos 2x = \cos^2 x - \sin^2 x$$  (8)

3. Mark each identity true or false.

$$\sqrt{a + b} = \sqrt{a} + \sqrt{b}$$  (9)
$$(a + b)^2 = a^2 + b^2$$  (10)
$$\ln (a + b) = \ln a + \ln b$$  (11)
$$\sin (a + b) = \sin a + \sin b$$  (12)
$$\frac{1}{a + b} = \frac{1}{a} + \frac{1}{b}$$  (13)
$$\frac{a + b}{b} = a$$  (14)
$$2^{x+y} = 2^x \cdot 2^y$$  (15)

4. Suppose the function $f$ is defined by

$$f(x) = \begin{cases} x & \text{for } x < 1 \\ x^2 - 1 & \text{for } x \geq 1. \end{cases}$$

Then which one of the following equations is correct? Circle it.

(a) $f(1) = 1$
(b) $f(1) = 0$
(c) $f(1) = \begin{cases} 1 \\ 0 \end{cases}$

5. True or false? $\sin^{-1} x = \frac{1}{\sin x}$

6. Find two functions $f$ and $g$ such that $f(g(x)) = \sqrt{2x - 4}$:

$$f(x) = \ldots \ldots \ldots, \ g(x) = \ldots \ldots \ldots$$
7. Name the curve defined by the equation $x^2 + y^2 = 4$: .............

8. What are the $y$ values of the horizontal asymptotes of $\arctan = \tan^{-1}$?
   (a) $\pm \frac{\pi}{2}$  
   (b) $\pm \pi$  
   (c) 0, 1  
   (d) $\pm \infty$  
   (e) $\arctan$ has no horizontal asymptotes.

9. What is the horizontal asymptote of $f(x) = e^x$ for $x < 0$? $y = ......$

10. The domain of the function $f(x) = \ln (x - 2)$ is ..................

11. $x^{-1/4} = (\text{circle all expressions that are equal})$
   (a) $\frac{1}{x}$
   (b) $\frac{1}{x^4}$
   (c) $\frac{1}{\sqrt[4]{x}}$
   (d) $-\frac{1}{\sqrt[4]{x}}$
   (e) $-\sqrt[4]{x}$
   (f) $x - \frac{1}{4}$
   (g) $\frac{1}{4}$
   (h) expression is undefined.

**Scoring:** Each correctly identified T or F in questions 1-3 and 11 is worth one point. Each correct answer in questions 4-10 is worth one point. Both functions $f$ and $g$ must be correct to earn the point on this question. There is a total of 30 points on this test.