Name: ___________________ Class:___ Date: _____________

1. (a) When $x = 2$, $y \approx 2.7$. Thus, $f(2) \approx 2.7$.

(b) $f(x) = 3 \quad \Rightarrow \quad x \approx 2.3, 5.6$

(c) The domain of f is $-6 \leq x \leq 6$, or $[-6, 6]$.

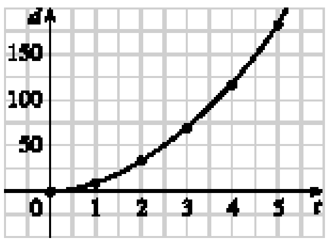
(d) The range of f is $-4 \leq y \leq 4$, or $[-4, 4]$.

(e) f is increasing on $[-4, 4]$, that is, on $-4 \leq x \leq 4$.

(f) f is not one-to-one since it fails the Horizontal Line Test.

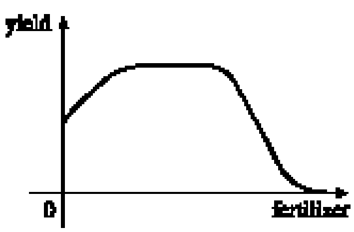
(g) f is odd since its graph is symmetric about the origin.

3. (a)



(b) From the graph, we see that the distance traveled after 4.5 seconds is slightly less than 150 feet.

4. There will be some yield with no fertilizer, increasing yields with increasing fertilizer use, a leveling-off of yields at some point, and disaster with too much fertilizer use.



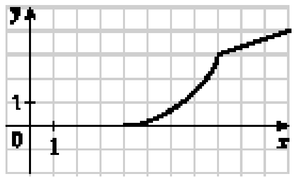
5. $f(x) = \sqrt{4 - 3x^2}$. Domain: $4 - 3x^2 \geq 0 \quad \Rightarrow \quad 3x^2 \leq 4 \quad \Rightarrow \quad x^2 \leq \frac{4}{3} \quad \Rightarrow \quad |x| \leq \frac{2}{\sqrt{3}}$.

Range: $y \geq 0$ and $y \leq \sqrt{4} \quad \Rightarrow \quad 0 \leq y \leq 2$.

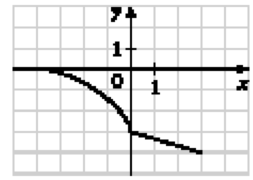
8. $y = \ln \ln x$. Domain: We must have $\ln x > 0 \quad \Rightarrow \quad x > e^0 \quad \Rightarrow \quad x > 1$. Range: $\ln x > 0$, so $\ln(\ln x)$ takes on all real numbers and, hence, the range is $\mathbb{R}$.

Name: ___________________ Class:___ Date: ______________

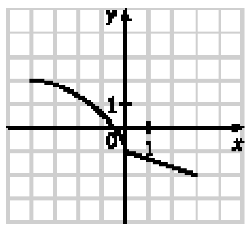
10. (a) To obtain the graph of $y = f(x-8)$, we shift the graph of $y = f(x)$ right 8 units.



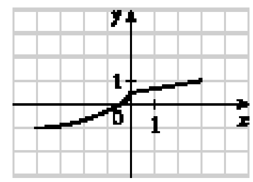
(b) To obtain the graph of $y = -f(x)$, we reflect the graph of $y = f(x)$ about the x-axis.



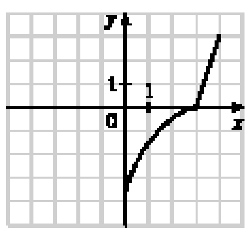
(c) To obtain the graph of $y = 2 - f(x)$, we reflect the graph of $y = f(x)$ about the x-axis, and then shift the resulting graph 2 units upward.



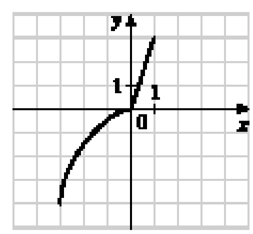
(d) To obtain the graph of $y = \frac{1}{2}f(x) - 1$, we shrink the graph of $y = f(x)$ by a factor of 2, and then shift the resulting graph 1 unit downward.



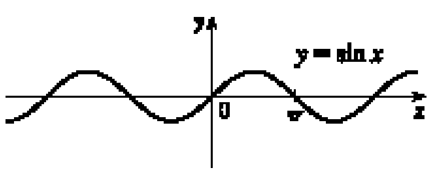
(e) To obtain the graph of $y = f^{-1}(x)$, we reflect the graph of $y = f(x)$ about the line $y = x$.

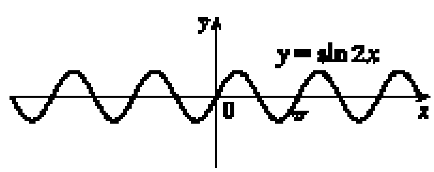


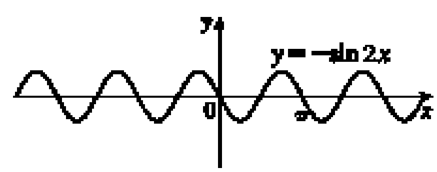
(f) To obtain the graph of $y = f^{-1}(x+3)$, we reflect the graph of $y = f(x)$ about the line $y = x$ [see part (e)], and then shift the resulting graph left 3 units.



11. $y = -\sin 2x$: Start with the graph of $y = \sin x$, compress horizontally by a factor of 2, and reflect about the x-axis.

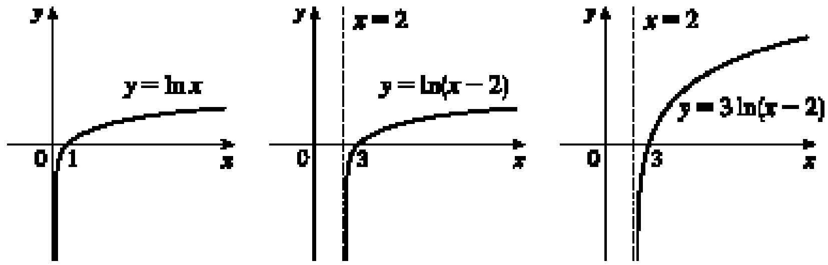




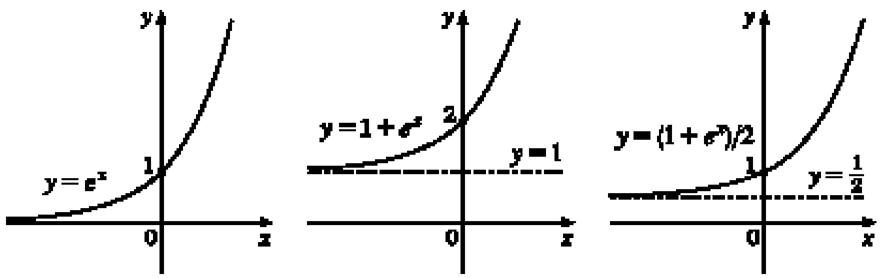


Name: __________________ Class:___ Date: _____________

12. $y = 3\ln(x-2)$: Start with the graph of $y = \ln x$, shift 2 units to the right, and stretch vertically by a factor of 3.



13. $y = (1 + e^x)/2$: Start with the graph of $y = e^x$, shift 1 unit upward, and compress vertically by a factor of 2.



17. (a) The terms of f are a mixture of odd and even powers of x, so f is neither even nor odd.

(b) The terms of f are all odd powers of x, so f is odd.

(c) $f(-x) = e^{-(-x)^2} = e^{-x^2} = f(x)$, so f is even.

(d) $f(-x) = 1 + \sin(-x) = 1 - \sin x$. Now $f(-x) \neq f(x)$ and $f(-x) \neq -f(x)$, so f is neither even nor odd.

19. $f(x) = \ln x, \quad D = (0, \infty); \quad g(x) = x^2 - 9, \quad D = \mathbb{R}$.

$(f \circ g)(x) = f(g(x)) = f\left(x^2 - 9\right) = \ln\left(x^2 - 9\right)$.

Domain: $x^2 - 9 > 0 \quad \Rightarrow \quad x^2 > 9 \quad \Rightarrow \quad |x| > 3 \quad \Rightarrow \quad x \in (-\infty, -3) \cup (3, \infty)$

$(g \circ f)(x) = g(f(x)) = g(\ln x) = (\ln x)^2 - 9$. Domain: $x > 0$, or $(0, \infty)$

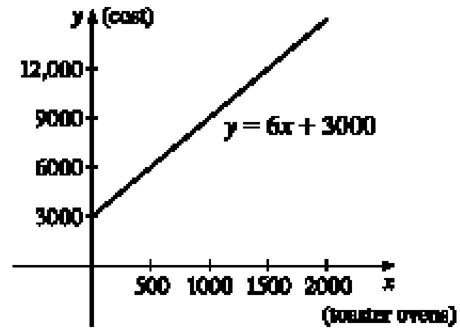
$(f \circ f)(x) = f(f(x)) = f(\ln x) = \ln(\ln x)$. Domain: $\ln x > 0 \quad \Rightarrow \quad x > e^0 = 1$, or $(1, \infty)$

$(g \circ g)(x) = g(g(x)) = g\left(x^2 - 9\right) = \left(x^2 - 9\right)^2 - 9$. Domain: $x \in \mathbb{R}$, or $(-\infty, \infty)$

22. (a) Let x denote the number of toaster ovens produced in one week and y the associated cost. Using the points $(1000, 9000)$ and $(1500, 12{,}000)$, we get an equation of a line:

$$y - 9000 = \frac{12{,}000 - 9000}{1500 - 1000}(x - 1000) \quad \Rightarrow$$

$$y = 6(x - 1000) + 9000 \quad \Rightarrow \quad y = 6x + 3000.$$



(b) The slope of 6 means that each additional toaster oven produced adds \$6 to the weekly production cost.

(c) The y-intercept of 3000 represents the overhead cost—the cost incurred without producing anything.

25. (a) $e^{2\ln 3} = \left(e^{\ln 3}\right)^2 = 3^2 = 9$

(b) $\log_{10} 25 + \log_{10} 4 = \log_{10}(25 \cdot 4) = \log_{10} 100 = \log_{10} 10^2 = 2$

26. (a) $e^x = 5 \quad \Rightarrow \quad x = \ln 5$

(b) $\ln x = 2 \quad \Rightarrow \quad x = e^2$

(c) $e^{e^x} = 2 \quad \Rightarrow \quad e^x = \ln 2 \quad \Rightarrow \quad x = \ln(\ln 2)$