Solutions

B 1. slope = m = 4 Equation of the line is $4x - y = 1$. If $x = 0$, then $y = -1$.

A 2. A constant function is represented by a horizontal line which has a slope of zero.

C 3. $A = k \bullet r^2$ $\pi = k\left(\frac{1}{2}\right)^2$ $k = 4\pi$ Therefore, $A = (4\pi)(5^2) = 100\pi$

D 4. $f(-3) = \frac{2(-3)-1}{3} = \frac{-7}{3} = -2\frac{1}{3}$

D 5. $\frac{a}{2} = a \bullet a^2 = a^3$ $a = 2a^3$ $2a^3 - a = 0$ $a\left(2a^2 - 1\right) = 0$ Therefore, $a = 0$
or $2a^2 - 1 = 0$ $\Rightarrow$ $\left\{0, \frac{1}{\sqrt{2}}, \frac{-1}{\sqrt{2}}\right\}$

A 6. $f\left(\frac{-1}{a}\right) = \frac{-3}{a}$ $g\left(\frac{-3}{a}\right) = \left(\frac{-3}{a}\right)^2 - 1$ $\frac{9}{a^2} - \frac{a^2}{a^2} = \frac{9-a^2}{a^2}$

D 7. $f(2-h) = -(2-h)^2 + 1 = -(4 - 4h + h^2) + 1 = -h^2 + 4h - 3$
$f(h) = -h^2 + 1$ Therefore, $\left(-h^2 + 4h - 3\right) - \left(-h^2 + 1\right) = 4h - 4$.

B 8. The value of **c** represents the y-intercept of the graph. The ordered pair (0, 17) is given in the problem. Therefore, **c** = 17.

A 9. Let x = number of price increases
revenue = $R(x) = (80{,}000 - 10{,}000x)(\$1.60 + \$0.40x) = -\$4000x^2 + \$16{,}000x + \$128{,}000$
Maximum occurs at $\left(\frac{-b}{2a}, R\left(\frac{-b}{2a}\right)\right)$ which is (2, \$144,000).
Therefore, x = 2 and there should be a price increase of (2)(\$0.40) = \$0.80.
The magazine will now cost \$2.40.

D 10.

(A)	$f(a+b) = a^2 + 2ab + b^2$	$f(a) + f(b) = a^2 + b^2$	$a^2 + 2ab + b^2 \neq a^2 + b^2$
(B)	$f(a+b) = \frac{1}{a+b}$	$f(a) + f(b) = \frac{1}{a} + \frac{1}{b}$	$\frac{1}{a+b} \neq \frac{1}{a} + \frac{1}{b}$
(C)	$f(a+b) = 4a + 4b + 1$	$f(a) + f(b) = 4a + 4b + 2$	$4a + 4b + 1 \neq 4a + 4b + 2$
(D)	$f(a+b) = 3a + 3b$	$f(a) + f(b) = 3a + 3b$	$3a + 3b = 3a + 3b$

D 11. $w = \frac{(k_1)}{z^2}$ and $z = (k_2)x^3$ Therefore, $w = \frac{(k_1)}{\left(k_2x^3\right)^2} = \frac{(k_1)}{(k_2)^2 \bullet x^6} = \frac{(k_3)}{x^6}$, where k_1, k_2, and k_3 are constants.

A 12. Example: Suppose you park for 2.5 hours. The cost should be \$3.00 + \$2.00 + \$2.00 = \$7.00.
(A) $3 + 2\lceil 2.5 - 1 \rceil = 3 + 2\lceil 1.5 \rceil = 3 + 2(2) = 3 + 4 = \$7.00$
Example: Suppose you park for 3 hours. The cost should be \$3.00 + \$2.00 + \$2.00 = \$7.00.
(A) $3 + 2\lceil 3 - 1 \rceil = 3 + 2\lceil 2 \rceil = 3 + 2(2) = 3 + 4 = \$7.00$

B 13. $y = 4x^3 + 0x^2 + cx - 27$. The product of the roots is $\frac{27}{4}$ and the sum of the roots is zero. Represent the roots as $\{r, r, -2r\}$. Therefore, $-2r^3 = \frac{27}{4}$ and $r = \frac{-3}{2}$. Now, the roots are known to be $\left\{\frac{-3}{2}, \frac{-3}{2}, 3\right\}$. The equation may be written as $y = (2x + 3)(2x + 3)(x - 3) = 4x^3 - 27x - 27$ and we see that $c = -27$.

C 14. $v_0 = 72$ and $s_0 = 0$ (which represents ground level). Therefore, we have $h(x) = -16x^2 + 72x + 0$.
Vertex is $\left(\frac{-72}{2(-16)}, h(x)\right)$ which is (2.25, 81). The maximum height of the ball will be 81 feet.

D 15. $f(2x) = \log_2(2 \bullet x) = \log_2 2 + \log_2 x = 1 + \log_2 x = 1 + f(x) = f(x) + 1$

C 16. $y = \frac{x}{x+1}$ Inverse is $x = \frac{y}{y+1}$. $xy + x = y$ $x = y - xy$ $x = y(1-x)$ $y = \frac{x}{1-x}; x \neq 1$

B 17. $g(5) = g(5-2) + 3(5) = g(3) + 15 = -5 + 15 = 10$
$g(7) = g(7-2) + 3(7) = g(5) + 21 = 10 + 21 = 31$
$g(9) = g(9-2) + 3(9) = g(7) + 27 = 31 + 27 = 58$ Therefore, $g(9) = 58$.

B 18. $y = e^x$ Points observed on the graph are (0, 1) and (1, 2.72).

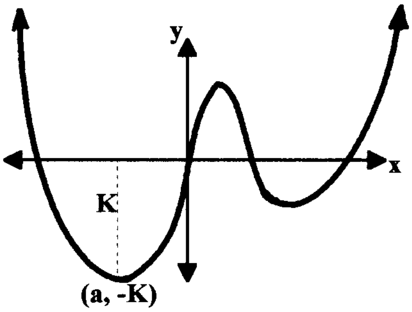
D 19. $f(x+1) = 2^{(x+1)} = 2^x \bullet 2^1 = f(x) \bullet 2 = 2 \bullet f(x)$

A 20. $f(x) = 2^x$ and $f(y) = 2^y$. Notice $f(x+y) = 2^{(x+y)} = 2^x \bullet 2^y$, which equals $f(x) \bullet f(y)$.

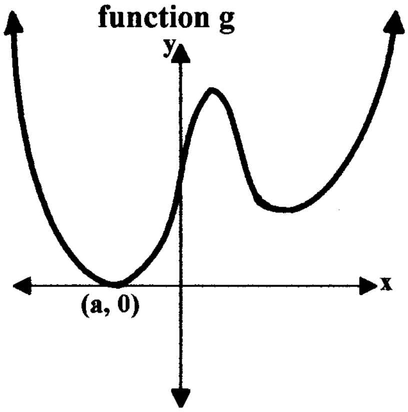
B 21. Possible graphs for **f** & **g**.

Notice, the minimum value of f(x) is −K. Therefore, when the graph of **f** is shifted upward K units, the graph of **g** is produced. Now the function **g** has only one root at x = a.

function f



function g



C 22. $y = x^3 + 2.5$ cubic

C 23. $A = P\left(1 + \frac{r}{n}\right)^{nt}$, where A = \$1000, r = 0.08, n = 12, & t = 1 $\$1000 = P\left(1 + \frac{.08}{12}\right)^{12}$
$\$1000 = 1.082999507 \bullet P$ P = \$923.36

D 24. $V(x) = (x)(6 - 2x)(10 - 2x) = 4x^3 - 32x^2 + 60x$

C 25. $y = \frac{(2x+3)(x-2)}{(x+2)(x-2)}$ The removeable discontinuity is at $(2, 1\frac{3}{4})$. The vertical asymptote is $x = -2$ and the horiztontal asymptote is $y = 2$.

B 26. $b = \frac{-1}{a}$ $\frac{g(1)}{f(0)} = \frac{b-a}{b} = 10$ $10b = b - a$ $9b = -a$ $b = \frac{-a}{9}$
$\frac{-1}{a} = \frac{-a}{9}$ $a^2 = 9$ Therefore, $a = \pm 3$.

C 27. $5 = a^3$ $a = 5^{1/3}$ $h(-6) = a^{-6} = (5^{1/3})^{-6} = 5^{-2} = \frac{1}{25}$

A 28. Let g(x) = f(x). $\Rightarrow$ $x^2 - 5 = 4x$ $x^2 - 4x - 5 = 0$ $(x-5)(x+1) = 0$ $\{5, -1\}$
Therefore, the points of intersection are (5, 20) and (−1, −4) and the sum of the ordinates is 20 + (−4) = 16.

B 29. $3(x) \neq 3(-x)$ and $2x^3 \neq 2(-x)^3$ <u>Note</u>: $3(-x) = -3x$ and $2(-x)^3 = -2x^3$

A 30. $y = \frac{1}{6}x^2 - \frac{4}{3}x + \frac{2}{3} \Rightarrow (x-4)^2 = 6(y+2) \Rightarrow 4a = 6$ $a = \frac{3}{2} \Rightarrow$ Focus is $(4, \frac{-1}{2})$.
y-intercept is $\left(0, \frac{2}{3}\right)$. The slope of the line is $\frac{-7}{24}$. The equation of the line is $y = \frac{-7}{24}x + \frac{2}{3}$. Standard form is $7x + 24y = 16$.