1. Use the binomial theorem to expand and simplify:

a) $\left(x^2-y^2\right)^3$ ***b)*** $(3t-5x)^4$ ***c)*** $\left(\frac{1}{3}x+y^2\right)^5$ ***d)*** $\left(\sqrt{x}-\sqrt{2}\right)^6$

2. Determine whether each relation is a function and find the domain and the range.

a) $\{(1,\ 2),\ (2,\ 3),\ (3,\ 2),\ (4,\ 5),\ (5,\ 4),\ (6,\ 1),\ (8,\ 2)\}$

b) $\{(-1,\ 2),\ (-2,\ -3),\ (3,\ 2),\ (5,\ 5),\ (5,\ 4),\ (-2,\ 1),\ (6,\ 2)\}$

c) $\{(1,\ 2),\ (2,\ 3),\ (3,\ 2),\ (4,\ 4),\ (5,\ 4),\ (6,\ 1),\ (7,\ 2),\ (-1,\ 2)\}$

3. Given $g(x)=-2x^2+x+6$, find:

a) $g(0)$ *b)* $g(-4)$ *c)* $g(2)$ *d)* $g(x+1)$

4. For $f(x)=\frac{2x-3}{x-4}$, determine

a) $f(0)$ *b)* $f(3)$ *c)* $f(x+h)$ *d)* $f(-4)$

5. Solve the following equations:

a) $6x^2-17x+12=0$

b) $3(x-3)^2=-84$

c) $7x=3-6x^2$

d) $3(x-3)^{3/2}=8$

e) $2x^2+12x+3=0$

f) $x^2+x+2=0$

g) $\sqrt[3]{5x+7}=-2$

h) $\sqrt{4x+5}=2x-5$

i) $4x-5=16x^3-20x^2$

j) $4x^4-x^2-3=0$

k) $x-2\sqrt{x}+1=0$

l) $x^{2/3}+x^{1/3}-12=0$

m) $x^{1/2}-4x^{1/4}+3=0$

n) $2|5-3m|-4=20$

6. Solve the following inequalities and express the solutions in interval notation.

a) $2(y+7)>2(4y+1)-3y$

b) $\frac{x}{5}+\frac{1}{3}\le\frac{x}{2}+1$

c) $-13\le 7+4x<17$

d) $|3z+1|-9>-2$

e) $|6x+3|<-3$

f) $|6x+3|\ge -7$

g) $2x^2-9x+4\le 0$

h) $-x^2<5x$

i) $2x^2-3x-2>0$

j) $x^3+x^2\ge 48x$

k) $\frac{3-x}{x+5}\ge 0$

l) $\frac{x-2}{x+3}\le 4$

7. For $f(x) = -x^2 + 6x - 5$, find

a) Find the vertex point
b) Find the line of symmetry
c) State whether there is a maximum or minimum value *and* find that value
d) Find the zeros of $f(x)$
e) Find the range and the domain of the function.
f) Graph the function and ***label.***
g) On what intervals is the function increasing? Decreasing?

8. For $g(x) = x^2 + x - 6$, find

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9. The height of a projectile fired upward from the ground with an initial velocity of 128 *ft./s* is given by $s = -16t^2 + 128t$, where *s* is the height in *feet* and *t* is the time in *seconds*. Find the times at which the projectile will be 192 *feet* above the ground.

10. A rancher has 360 *yd.* of fencing with which to enclose two adjacent rectangular corrals, one for sheep and one for cattle. A river forms one side of the corrals. Suppose the width of each corral is *x* yards.

a) Express the total area of the two corrals as a function of *x*.
b) Find the domain of the function.
c) Find the maximum area
d) Find the dimensions that maximize the corrals area

11. A projectile is fired vertically upward, and its height $s(t)$ in feet after *t* seconds is given by the function defined by $s(t) = -16t^2 + 800t + 600$

a) From what height was the projectile fired?
b) After how many seconds will it reach its maximum height?
c) What is the maximum height it will reach?

12. A ball is thrown upwards, and its height s at time t can be determined by the function $s(t) = -16t^2 + 48t + 8$, where s is measured in feet above the ground and t is the number of seconds of flight. Find:

a) The time it takes the ball to reach its maximum height.
b) The maximum height the ball attains.

13. The period T of the pendulum is the time it takes the pendulum to complete one swing from left to right and back. For a pendulum near the surface of Earth

$$T = 2\pi \sqrt{\frac{L}{32}}$$

Where T is measured in *seconds* and L is the length of the pendulum in *feet*. Find the length of a pendulum that has a period of 4 *seconds*.

14. If a projectile is launched from ground level with an initial velocity of 96 *feet* per *sec*, its height in feet t *seconds* after launching is s *feet*, where

$$s = -16t^2 + 96t$$

When will the projectile be greater than 80 *feet* above the ground?

15. You can rent a car for the day from Company ***A*** for \$29.00 plus \$0.12 a *mile*. Company ***B*** charges \$22.00 plus \$0.21 a *mile*. Find the number of miles m per day for which it is cheaper to rent from Company ***A***.

Solution

1. a) $x^6 - 3x^4y^2 + 3x^2y^4 - y^6$

b) $81t^4 - 540t^3x + 1350t^2x^2 - 1500tx^3 + 625x^4$

c) $= \frac{1}{243}x^5 + \frac{5}{81}x^4y^2 + \frac{10}{27}x^3y^4 + \frac{10}{9}x^2y^6 + \frac{5}{3}xy^8 + y^{10}$

d) $= x^3 - 6x^2\sqrt{2x} + 30x^2 - 40x\sqrt{2x} + 60x - 60\sqrt{2x} + 8$

2. a) *Function*; $Domain = \{1,2,3,4,5,6,8\}$ $Range = \{1,2,3,4,5\}$

b) *Not a function*; $Domain = \{-2,-1,1,3,5,6\}$ $Range = \{-3,1,2,4,5\}$

c) *Function*; $Domain = \{-1,1,2,3,4,5,6,7\}$ $Range = \{1,2,3,4\}$

3. a) 6 b) -30 c) 0 d) $-2x^2 - 3x + 5$

4. a) $\frac{3}{4}$ b) -3 c) $\frac{2x+2h-3}{x+h-4}$ d) $\frac{11}{8}$

5.

a) $x = \left\{\frac{4}{3}, \frac{3}{2}\right\}$

b) $x = 3 \pm 2i\sqrt{7}$

c) $x = \left\{-\frac{3}{2}, \frac{1}{3}\right\}$

d) $x = 3 + \frac{4}{\sqrt[3]{9}}$ *or* $x = 3 + \frac{4}{3}\sqrt[3]{3}$

e) $\frac{-6 \pm \sqrt{30}}{2}$

f) $-\frac{1}{2} \pm \frac{\sqrt{7}}{2}i$

g) $x = -3$

h) $x = 5$

i) $x = \left\{\frac{5}{4}, \pm\frac{1}{2}\right\}$

j) $x = \left\{\pm 1, \frac{\pm i\sqrt{3}}{2}\right\}$

k) $x = 1$

l) $x = \{-64,\ 27\}$

m) $x = 1,\ 81$

n) $m = \left\{-\frac{17}{3}, \frac{7}{3}\right\}$

6.

a) $(-\infty, 4)$

b) $\left[\frac{20}{9}, \infty\right)$

c) $\left[-5,\ \frac{5}{2}\right)$

d) $(2, \infty)$

e) *No Solution*

f) $(-\infty,\ \infty)$

g) $\left[\frac{1}{2},\ 4\right]$

h) $(-\infty,\ -5) \cup (0,\ \infty)$

i) $\left(-\infty, -\frac{1}{2}\right) \cup (2, \infty)$

j) $\left[\frac{-1-\sqrt{193}}{2},\ 0\right] \cup \left[\frac{-1+\sqrt{193}}{2},\ \infty\right)$

k) $(-5,\ 3]$

l) $\left(-\infty,\ -\frac{14}{3}\right] \cup (-3,\ \infty)$

7. Vertex: $x=-\frac{b}{2a}$ $\quad f(x)=-x^2+6x-5$

$$=-\frac{6}{2(-1)}$$

$$=3$$

$$y=f(3)=-(3)^2+6(3)-5$$

$$=4$$

Vertex point: $(3,4)$

Axis of symmetry: $x=3$

Maximum point @ $(3,4)$

x-intercept: $x=1,5$

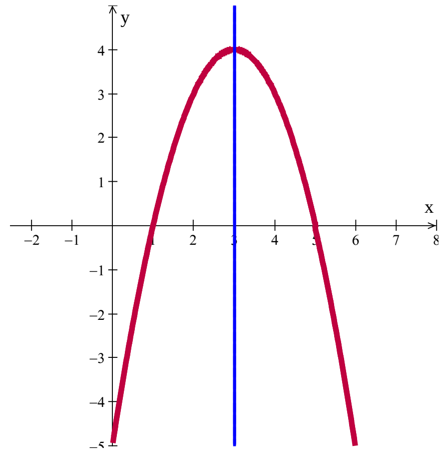
y-intercept: $y=-5$

Domain: $(-\infty,\infty)$

Range: $(-\infty,4]$

Increasing: $(-\infty,3)$

Decreasing: $(3,\infty)$



8. Vertex: $x=-\frac{1}{2(1)}=-\frac{1}{2}$

$$y=f\left(-\frac{1}{2}\right)=\left(-\frac{1}{2}\right)^2+\left(-\frac{1}{2}\right)-6=-\frac{25}{4}$$

Vertex point: $\left(-\frac{1}{2},-\frac{25}{4}\right)$

Axis of symmetry: $x=-\frac{1}{2}$

Maximum point @ $\left(-\frac{1}{2},-\frac{25}{4}\right)$

x-intercept: $x=-3,2$

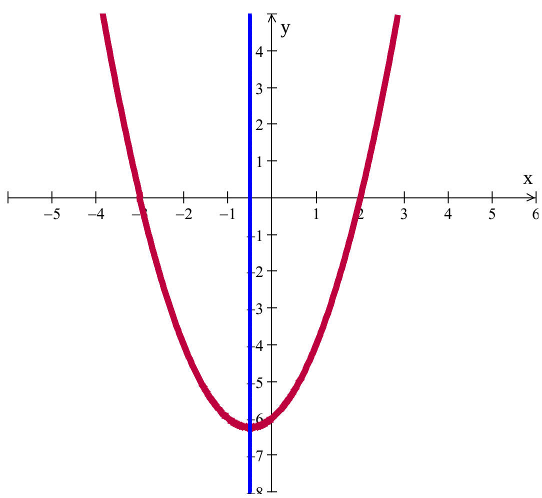
y-intercept: $y=-6$

Domain: $(-\infty,\infty)$

Range: $\left[-\frac{25}{4},\infty\right)$

Increasing: $\left(-\frac{1}{2},\infty\right)$

Decreasing: $\left(-\infty,-\frac{1}{2}\right)$



9. t = 2 and 6 *sec*. height 192 *ft*

10. *a*) $A(x)=360x-3x^2$ *b*) Domain: $0<x<120$ *c*) 10800 yd^2 *d*) 60 by 180 *yd*.

11. *a*) Height = 600 *ft*. (t = 0) *b*) t = 25 sec. *c*) Max. Height: 10,600 *feet*.

12. *a*) $t = 1.5$ secs *b*) Max height is 44 *feet*.

13. $L = \dfrac{128}{\pi^2}$ *feet*

14. $(1,\ 5)$

15. $\dfrac{700}{9}$ *days*