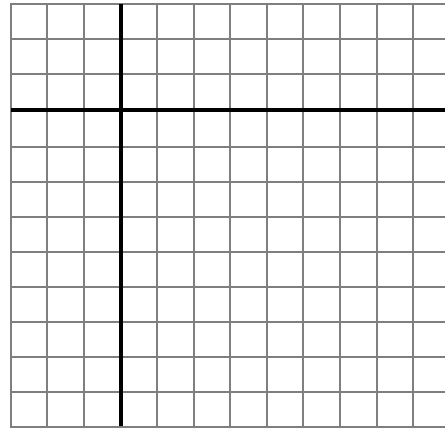**MAT 171 – TEST #4 REVIEW – Section 3.1 – 3.5, 3.7**

1) Sketch the graph of the quadratic equation. Identify the vertex, axis of symmetry, x-intercept(s), and y-intercept.

$$f(x) = x^2 - 6x + 1$$

2) Determine whether the given quadratic function has a minimum value or maximum value. Then find the coordinates of the minimum or maximum point. Find the domain, and find the range.

   a) $f(x) = -x^2 + 2x - 4$

   b) $f(x) = 4x^2 - 2x - 8$

3) Use long division to divide.

$$\left(x^3 - 7x^2 + 13x + 3\right) \div (x - 2)$$

4) Use synthetic division to divide.

$$\left(2x^4 + 3x^2 - 1\right) \div (x - 3)$$

5) Use synthetic division to find the quotient and remainder when dividing $2x^3 + \dfrac{1}{2}x^2 + \dfrac{1}{4}x - \dfrac{1}{4}$ by $x + \dfrac{3}{4}$.

6) If $P(x) = 3x^3 - 5x^2 + 6x - 7$, find $P(-2)$ using synthetic division.

7) Use factoring to find the zeros of the function below, and identify the multiplicity. Find the end behavior and the y-intercept. Draw a rough sketch of the graph of the function.

$$f(x) = 2x^4 - 2x^3 - 4x^2$$

8) Find all the zeros of the function and their multiplicity, state the degree of the function, and draw a rough sketch.

$$P(x) = x^2(x - 4)(x + 2)^3(x - 4i)(x + 4i)$$

9) Find a polynomial $g(x)$ of lowest degree,

   a) with $a = 1$ (leading coefficient), that has zeros -2 (multiplicity 3), 0 (multiplicity 2), and $3+5i$. Leave the answer in factored form and indicate the degree of $g(x)$.

   b) that goes through the point $g(-4) = -138$ and has zeros -2 and $1 \pm \sqrt{2}$. Leave the answer in factored form.

10) Use the Rational Zero Test to list all possible rational zeros of f.

$$f(x) = 20x^3 - 12x^2 - 3x + 2$$

11) Use the given zero to find all the zeros of the function.

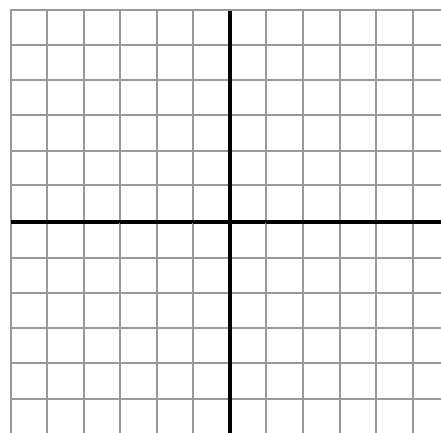$$h(x) = x^3 - 2x^2 + 16x - 32; \quad -4i$$

12) Find the zeros and write $k(x) = 10x^3 + 21x^2 - 25x + 6$ as a product of linear factors.

13) Find the zeros and write $f(x) = x^4 - 3x^3 - 2x^2 + 6x + 4$ as a product of linear factors.

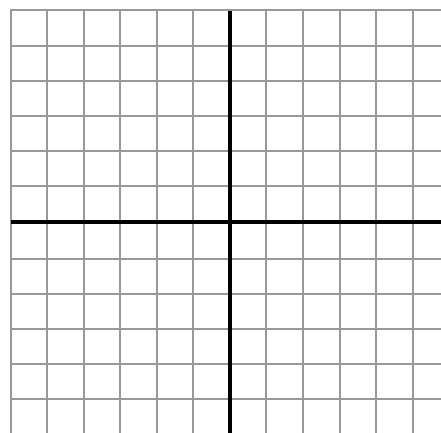14) Find the zeros and write $f(x) = x^3 + x^2 + 3x - 45$ as a product of linear factors.

15) Find any vertical and horizontal asymptotes, identify all intercepts, and sketch the graph of the rational function.

$$f(x) = \frac{x+3}{2x+3}$$

16) Find any vertical and horizontal asymptotes, identify all intercepts, and sketch the graph of the rational function.

$$f(x) = \frac{x^2 - 3x - 4}{x^2 - x - 6}$$

17) Find the domain, vertical asymptote(s) and horizontal asymptote of

a) $f(x) = \dfrac{x+6}{x^2 - x - 42}$

b) $f(x) = \dfrac{4x^3}{x^2 + 6x + 5}$

18) Write an equation that expresses the relationship. Use k for the constant of proportionality.

a) P varies directly as the square of R and inversely as the cube of S.

b) u varies jointly as v and w and inversely as the cube root of z.

19) y varies jointly as a and b and inversely as the square root of c. $y = 54$ when $a = 9$, $b = 6$, and $c = 16$. Find y when $a = 7$, $b = 2$, and $c = 100$.

20) The volume V of a given mass of gas varies directly as the temperature T and inversely as the pressure P. A measuring device is calibrated to give $V = 533$ in^3 when $T = 410°$ and $P = 10$ lb/in^2. What is the volume on this device when the temperature is $420°$ and the pressure is 25 lb/in^2?

21) The pressure of a gas varies jointly as the amount of the gas (measured in moles) and the temperature and inversely as the volume of the gas. If the pressure is 825 kPa (kilopascals) when the number of moles is 5, then temperature is $250°$ Kelvin, and the volume is 400 cc, find the pressure when the number of moles is 7, the temperature is $310°K$, and the volume is 840 cc.

22) Body-mass index, or BMI, takes both weight and height into account when assessing whether an individual is underweight or overweight. BMI varies directly as one's weight, in pounds, and inversely as the square of one's height, in inches. In adults, normal values for the BMI are between 20 and 25. A person who weighs 190 pounds and is 68 inches tall has a BMI of 28.89. What is the BMI, to the nearest tenth, for a person who weighs 136 pounds and who is 63 inches tall?