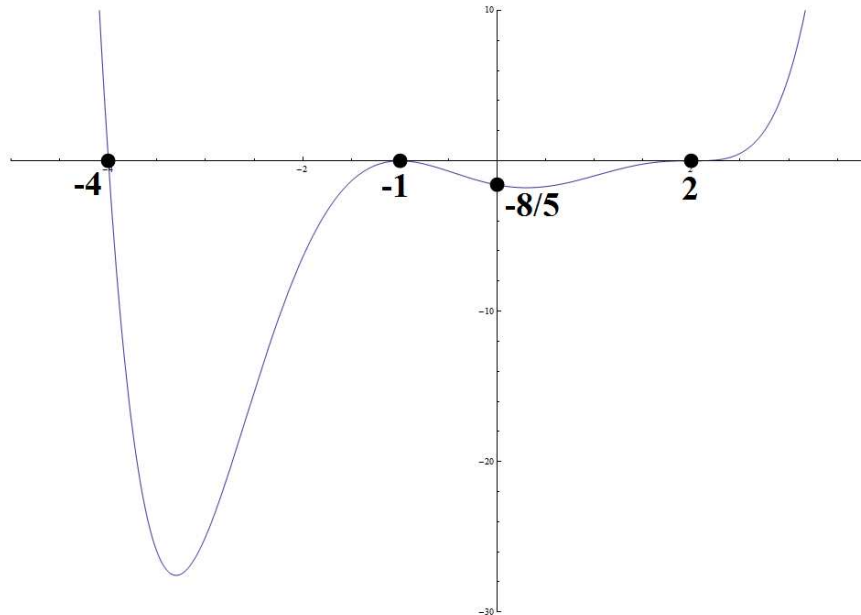


YOUR NAME: _____

George Voutsadakis

Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. Consider the following graph.



- (a) Specify formally its end behavior.
- (b) Give its y -intercept.
- (c) Find the roots and their multiplicities.
- (d) Find a possible equation for the function whose graph is shown.

2. (a) Perform the division $(x^5 - 2x^3 + 3x + 5) \div (x^2 + 2)$ and write your answer in an appropriate form.

- (b) Let $f(x) = 3x^3 + 28x^2 + 43x - 42$. Suppose we know that $x = -7$ is a zero of $f(x)$. Use the Factor Theorem to find the remaining zeros of $f(x)$.

3. Consider $f(x) = \frac{2(x+1)(x-3)}{(x-1)(x+2)^2}$.

(a) Find the domain.

(b) Find the vertical asymptotes.

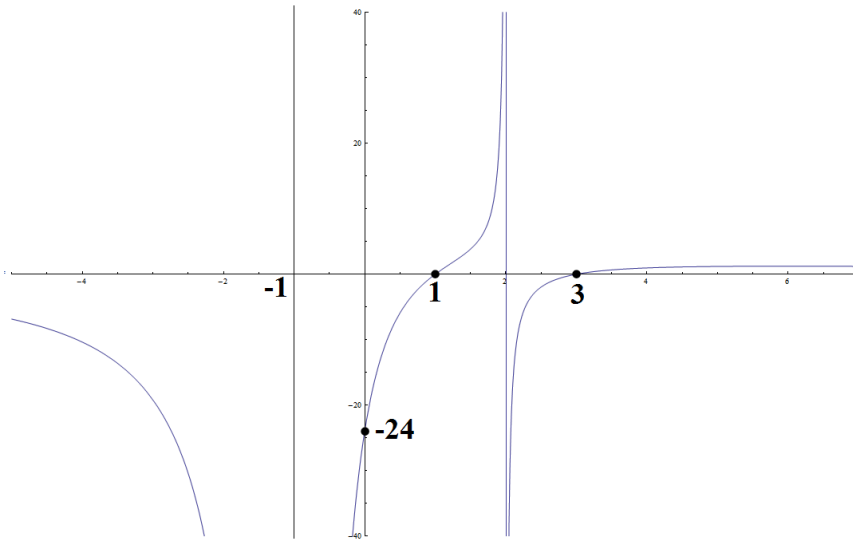
(c) Find the horizontal asymptote.

(d) Find the y -intercept.

(e) Find the x -intercept(s).

(f) Sketch the graph of $y = f(x)$, clearly labeling all important points and showing all features.

4. Consider the function $y = f(x)$ whose graph is shown below.



- Find the domain.
- Find the vertical asymptotes.
- Find the horizontal asymptote.
- Find the y -intercept.
- Find the x -intercept(s).
- Find a possible formula for $f(x)$.

5. A quantity w varies directly with the square of x and with the square root of y and inversely with the cube of z .

(a) Write an appropriate equation of joint variation.

(b) If $w = 32$ when $x = 2$, $y = 4$ and $z = 1$, compute the value of z when $x = 2$, $y = 25$ and $w = 10$.