

YOUR NAME: \_\_\_\_\_

George Voutsadakis

1. Find an equation for the line  $\ell$  that passes through the point  $(16, 7)$  and is perpendicular to the line  $\ell'$  that passes through the points  $(-7, 12)$  and  $(3, 52)$ . Please, leave your answer in slope-intercept form.

2. Consider a parabola  $f(x) = -2x^2 + 8x + 11$ .
- (a) Find the location of its vertex showing all steps.
- (b) Find an equation in general form for the parabola  $y = g(x)$  that has the same vertex as  $y = f(x)$  and passes through the point  $(0, -5)$ .

3. (a) Consider the function  $f(x) = \frac{x+2}{3-x}$  admitting complex numbers as inputs. Compute  $f(1+5i)$  and leave your answer in standard form.

- (b) Showing all steps, calculate by hand the power  $i^{127}$ .

4. Consider the polynomial function  $f(x) = -x^4 - 2x^3 + 15x^2$ .

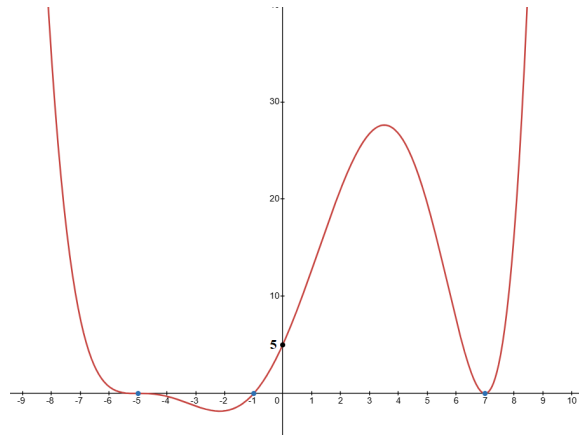
(a) Describe formally its end behavior.

(b) Find its  $y$ -intercept.

(c) Find its  $x$ -intercepts and their multiplicities.

(d) Use the information of Parts (a)-(c) to sketch the graph of  $y = f(x)$ .

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



(a) Describe its end behavior formally.

(b) Find the  $y$ -intercept.

(c) Find the  $x$ -intercepts and their multiplicities.

(d) Use the information of Parts (a)-(c) to devise a possible formula for  $f(x)$ .