Name_____Cumulative Mathematics Review 3

THIS IS ONE POINT IN CUMULATIVE GRADE

QUESTION 1

What is the total number of x- and y-intercepts in the graph of the equation $y = (x + 2)^2(x - 3)^2$?

A) Two

B) Three

C) Four

D) Five

QUESTION 2

$$y = -3(x - 2)^2 + 2$$

In the xy-plane, line l passes through the point $(-1, 3)$ and the vertex of the parabola with equation above. What is the slope of line l?

A) $-\frac{2}{3}$

B) $-\frac{1}{2}$

C) $-\frac{1}{3}$

D) $\frac{1}{3}$

QUESTION 3

Let function $f(x)$ be defined by the equation $f(x) = \frac{1}{2-x}$. If m is a positive integer, then $f\left(\frac{1}{m}\right) =$

A) $\frac{m}{2m-1}$

B) $\frac{m}{m^2-1}$

C) $\frac{1}{2-m}$

D) $2 - m$

QUESTION 4

If the complex number A satisfies the equation $A(2 - i) = 2 + i$, where $i = \sqrt{-1}$, what is the value of A?

A) $5 - i$

B) $5 + i$

C) $\frac{3}{5} + \frac{4}{5}i$

D) $\frac{3}{4} + \frac{5}{4}i$

Question 1

What is the total number of x- and y-intercepts in the graph of the equation $y = (x + 2)^2(x - 3)^2$?

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B **Advanced Mathematics (polynomials)**
MEDIUM-HARD

Given equation: $y = (x + 2)^2(x - 3)^2$

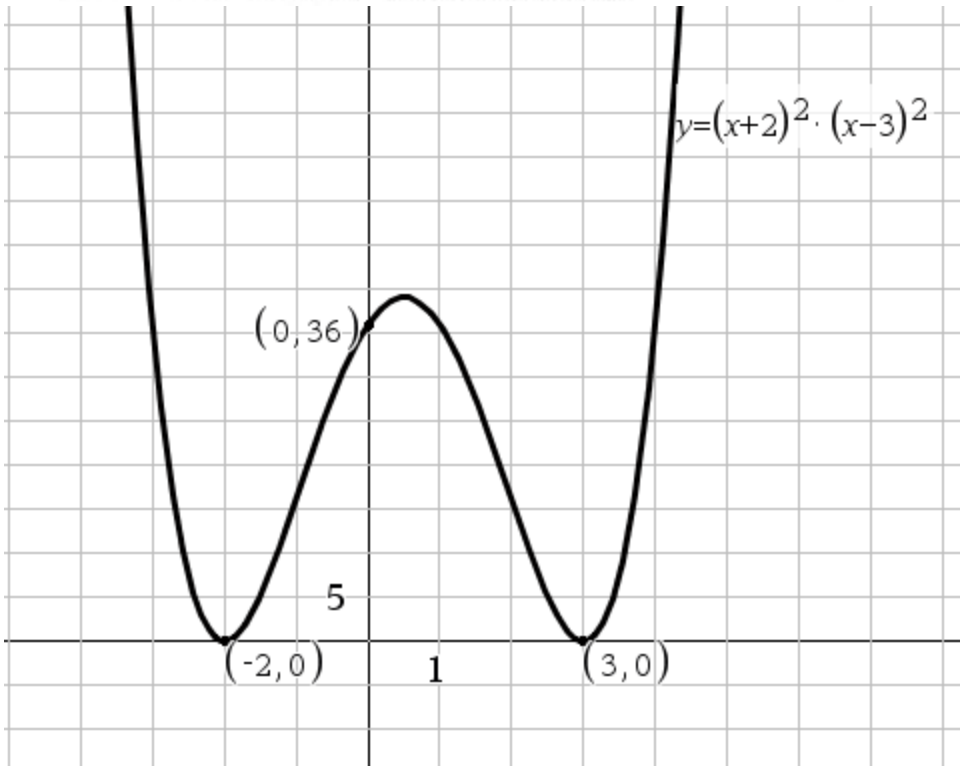
To find the y-intercept, set $x = 0$: $y = (0 + 2)^2(0 - 3)^2$

Simplify: $y = (2)^2(-3)^2 = (4)(9) = 36$

Therefore the y-intercept is at $(0, 36)$.

To find the x-intercepts, set $y = 0$: $0 = (x + 2)^2(x - 3)^2$

By the Zero Product Property, the only solutions to this equation are $x = -2$ and $x = 3$, so there are two x-intercepts and a total of three x- and y-intercepts.



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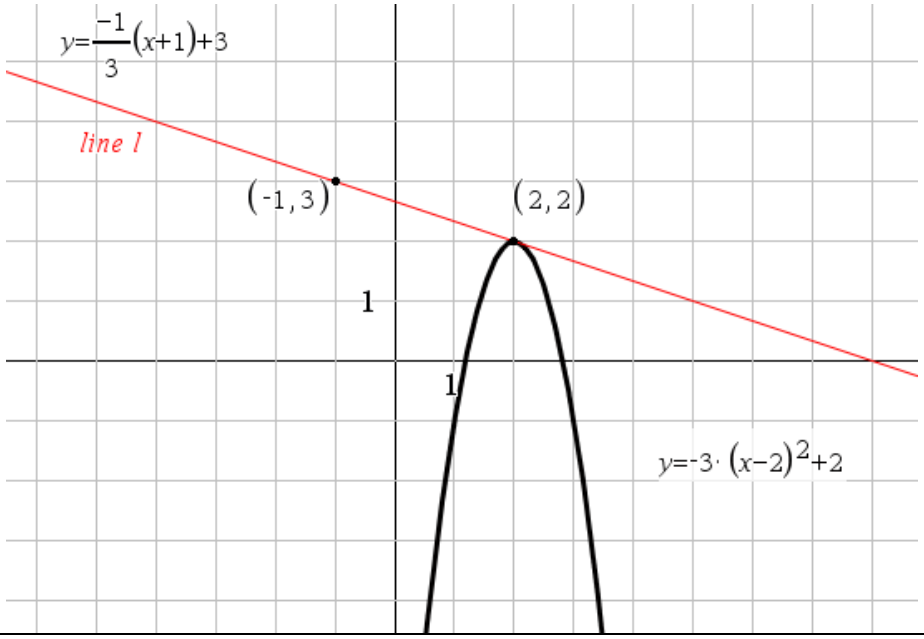
C **Advanced Mathematics (parabolas)**
MEDIUM

The vertex of a parabola with the equation $y = A(x-h)^2 + k$ is (h, k). For this parabola, $h = 2$ and $k = 2$. So, the vertex is $(2, 2)$. The slope of the line that passes through $(1, -3)$ and $(2, 2)$ is

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3-2}{-1-2} = \frac{1}{-3} = -\frac{1}{3}$$



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A **Algebra (simplifying expressions)**
MEDIUM-HARD

$$f(x)=\frac{1}{2-x}$$

Substitute $\frac{1}{m}$ for x: $$f\left(\frac{1}{m}\right)=\frac{1}{2-\left(\frac{1}{m}\right)}$$

Simplify the denominator:

$$f\left(\frac{1}{m}\right)=\frac{1}{2-\left(\frac{1}{m}\right)}=\frac{1}{\frac{2m}{m}-\frac{1}{m}}=\frac{1}{\frac{2m-1}{m}}$$

Divide by multiplying by the reciprocal:

$$1\div\frac{2m-1}{m}=1\times\frac{m}{2m-1}=\frac{m}{2m-1}$$

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C **Special Topics (complex numbers) HARD**

$$A(2 - i) = 2 + i$$

Divide by $(2 - i)$:

$$A = \frac{2+i}{2-i}$$

Multiply numerator and denominator by the conjugate $(2 + i)$:

$$A = \frac{(2+i)(2+i)}{(2-i)(2+i)}$$

FOIL:

$$A = \frac{4+2i+2i+i^2}{4-i^2}$$

Combine terms:

$$A = \frac{4+4i+i^2}{4-i^2}$$

Substitute $i^2 = -1$:

$$A = \frac{4+4i+(-1)}{4-(-1)}$$

Simplify:

$$A = \frac{4+4i-1}{4+1}$$

Combine terms:

$$A = \frac{3+4i}{5}$$

Distribute to express in standard $a + bi$ form:

$$A = \frac{3}{5} + \frac{4}{5}i$$