Math Analysis Release Items 2015

Open Ended Question

(a) Are there any real solutions to the given equation? If yes, find all possible solutions. If not, justify why not.

$(a^4 - 2a^2b^2 + b^4)^{x-1} - \dfrac{(a-b)^{2x}}{(a+b)^2} = 0$ where $a > b > 0$ are two real numbers.

The distance between a point $P(x, y)$ and point $Q(0, 3)$ is $\frac{3}{2}$ of the distance between the point $P(x, y)$ and the line $y = -2$. Find the equation of the curve on which the point P lies.

(a) $4x^2 - 5y^2 - 60y = 0$ (b) $4x^2 + 5y^2 - 60y + 9 = 0$ (c) $4x^2 = 5y + 9$
(d) $x^2 - y^2 - 12y - 9 = 0$ (e) $4x^2 - 5y^2 - 60y - 27 = 0$

The vertex of the parabola $y = -2x^2 + 4x + 6$ is

(a) $(-1, 3)$ (b) $(1, -8)$ (c) $(1, 8)$ (d) $(-1, 0)$ (e) $(3, 0)$

Consider the graph of the equation $9x^2 + 4y^2 = 36$. Find the equation of the graph obtained by rotating the given graph by an angle 90° in the counter clockwise direction.

(a) $\frac{x^2}{36} + y^2 = 1$ (b) $\frac{x^2}{4} + \frac{y^2}{9} = 1$ (c) $\frac{x^2}{9} + \frac{y^2}{4} = 1$
(d) $\frac{x^2}{9} - \frac{y^2}{4} = 1$ (e) None of the above

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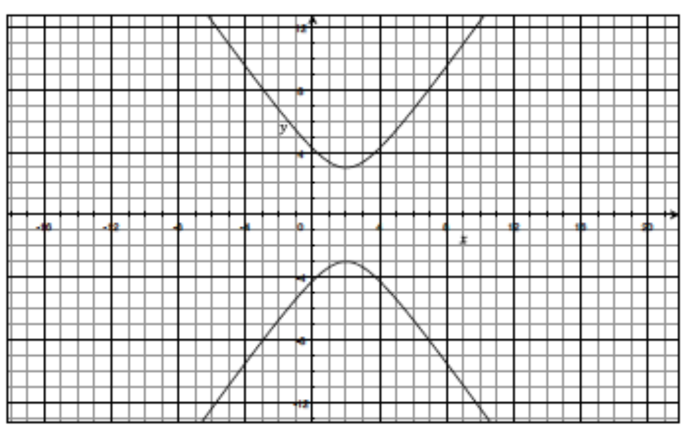
The domain of a rational function is all real numbers not equal to $-2, 2$ and 5 and the function eventually grows to positive infinity. Which of the following is a possible expression for this rational function?

(a) $f(x) = \dfrac{x^3+1}{x(x^2-4)(x-5)}$ (b) $f(x) = \dfrac{x^5+2x-1}{(x^2-4)(x-5)}$ (c) $f(x) = \dfrac{x^2+1}{(x^2-4)(x-5)}$
(d) $f(x) = -\dfrac{x^4+1}{(x^2-4)(x-5)}$ (e) $f(x) = \dfrac{x^5+1}{x(x^2-4)(x+5)}$

Which equation represents the graph?



(a) $(x-2)^2 = 3y$ (b) $\frac{y^2}{9} - \frac{(x-2)^2}{4} = 1$ (c) $\frac{x^2}{9} + \frac{(y-2)^2}{4} = 1$
(d) $\frac{(y-2)^2}{4} + \frac{x^2}{9} = 1$ (e) $y^2 = 3(x-2)$
