

Math 151 Takehome Exam #1. Justify all answers.

Q1. Perform the indicated operation and reduce the answer to lowest terms.

a) $\frac{x^2 - 5x - 14}{x^2 - 3x + 2} - \frac{x^2 - 4}{x^2 - 14x + 49}$ (10)

b) $\frac{y^2 + 5y + 4}{y^2 - 1} \cdot \frac{y + 5}{y + 5}$ (10)

c) $\frac{2x}{x^2 - 9} - \frac{1}{x + 3} - \frac{2}{x - 3}$ (10)

d) $\frac{4}{y + 2} - \frac{1}{y} + 1$ (10)

Q2. Determine the symmetry for the following functions

a) $y = x - x^2 - x^3$ (10)

b) $y = \frac{-x^7}{1 - x^4}$ (10)

Q3. Use transformations to graph the following function. Label all intercepts and vertices, if any.

$y = -2\sqrt{-(x - 2)}$ (10)

Q4. Find the equation of the line that is perpendicular to the line passing through the points $\{(-1, 7), (0, 5), (2.5, 0)\}$ and which has y-intercept $(0, -1)$. (10)

Q5. Solve each of the following

a) $|2x - 11| = |4x + 9|$ (10)

b) $|x - 4| = 7$ (10)

c) $|x| = 12 - x^2$ (10)

d) $|x - 4| - |x + 2| = 0$ (10)

e) $|2 - 6y| > 10$ (10)

f) $|9m + 2| \leq 1$ (10)

Q6 Graph $f(x) = |x + 2| - |x|$ (10)

Q7 The temperature T , in degrees Fahrenheit, t hours after 6 A.M. is given by
 $T(t) = \frac{1}{2}t^2 + 8t + 32$; $0 \leq t \leq 12$.

What is the warmest temperature of the day and when does it happen? (10)

Q8 The height h in feet of a model rocket above the ground t seconds after lift-off is

$$h(t) = -5t^2 + 100t$$

a) When does the rocket reach its maximum height?

b) What is the maximum height?

c) What distance does the rocket travel?

(10)

Q9 Complete the square to find the vertex of
 $f(x) = -3x^2 + 5x + 4$ (10)

Q10 Find the real solutions for
 $9x^2 + 5x^3 = 6x^4$ (10)

Q11 Find the zeros for the following polynomial. (10)
 $R(x) = x^7 + 10x^6 + 27x^5 - 57x^3 - 30x^2 + 29x + 20$

Q12 Sketch the graph of $P(x) = x^4 - x^3 - 6x^2 + 1$ (10)

Q13 Find the zeros of $P(x) = 2x^4 + x^3 + 3x^2 + 3x - 9$ (10)

Q14 Factor the following polynomial over the set of complex numbers: $f(x) = 3x^3 - 13x^2 + 43x - 13$

Bonus: Sketch the graph for the following equation:
 $|x| + x = |y| + y$