Mathematics 3201
Unit 5: Polynomial Functions and 4.5 Solving Rational Equations
Review

Name: Key

Section 1: Multiple Choice.

1. What is the leading coefficient of the polynomial: $y = -2x^2 + 5x - 3$? 1. B

A) -3 B) -2 C) 5 D) x

2. What is the end behaviour of the graph of: $y = -3x^3 + 4x + 5$? 2. C

A) Q2 to Q1 B) Q3 to Q1 C) Q2 to Q4 D) Q3 to Q4

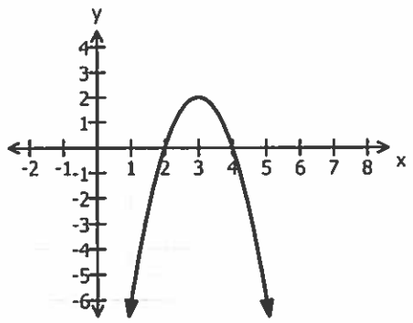
3. What is the maximum number of turning points a cubic polynomial have? 3. C

A) 0 B) 1 C) 2 D) 3

4. What is the domain of $y = 3x - 1$? 4. B

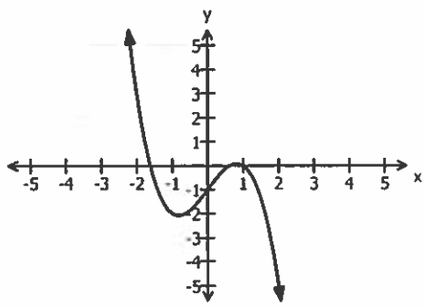
A) $\{x | x \geq -1, x \in R\}$ B) $\{x | x \in R\}$ C) $\{y | y \geq -1, y \in R\}$ D) $\{y | y \in R\}$

5. What is the range of the function graphed below? 5. D



A) $\{x | x \geq 3, x \in R\}$
B) $\{x | x \leq 3, x \in R\}$
C) $\{y | y \geq 2, y \in R\}$
D) $\{y | y \leq 2, y \in R\}$

6. What is the equation of the following graph? 6. B

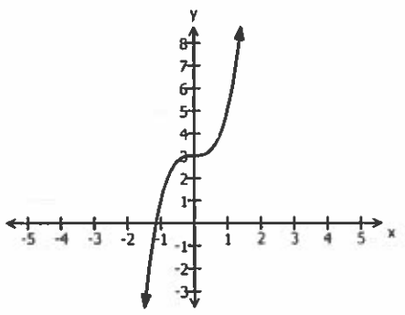


A) $y = x^3 + 2x - 1$
B) $y = -x^3 + 2x - 1$
C) $y = x^3 + 2x + 1$
D) $y = x^3 + 2x + 1$

7. What is the y-intercept of $y = 2x^2 + 3x - 5$? 7. A

A) -5 B) 2 C) 3 D) none

8. What is the constant term for the following graph? 8. D



A) -1
B) 0
C) 1
D) 3

9. From which quadrants does the graph of $y = -4x^2 - 7$ extend? 9. B

A) Q2 to Q1 B) Q3 to Q4 C) Q3 to Q1 D) Q2 to Q4

10. What is the degree of $y = 2x^3 - 4x^2 + 7x - 3$? 10. D

A) 0 B) 1 C) 2 D) 3

11. What is the maximum number of x-intercepts for $y = 3x - 5$? 11. B

A) 0 B) 1 C) 2 D) 3

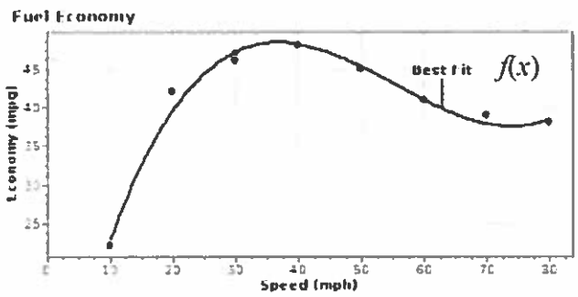
12. Which function passes through the point $(2,-10)$? 12. A

$-8+2-4$

A) $f(x) = -x^3 + x - 4$ B) $f(x) = -x^3 + x - 10$

C) $f(x) = x^3 + x - 4$ D) $f(x) = x^3 + x - 10$

13. Given the scatter plot and the curve of best fit of the polynomial $f(x)$, what is the value of $f(30)$? 13. C



A) 13

B) 32

C) 47

D) 58

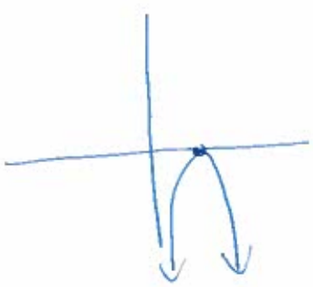
Section 2: Constructed Response.

1. Determine the following characteristics of each function:

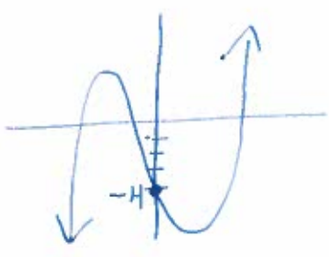
Characteristics	$f(x) = 3x^3 - 4x^2 + 2x - 1$	$f(x) = -2(x-3)^2 + 3$
Number of possible x-intercepts	1, 2 OR 3	0, 1 OR 2
y-intercept	-1	$y = -2(0-3)^2+3$ $y = -2(9)+3 = -18+3 = -15$
Domain	$x \in \mathbb{R}$	$x \in \mathbb{R}$
Range	$y \in \mathbb{R}$	$y \leq 3$
Number of possible turning points	0 OR 2	1
End behaviour	Q3 to Q1	Q3 to Q4

2. Sketch a possible graph of polynomial functions that satisfy each set of characteristics:

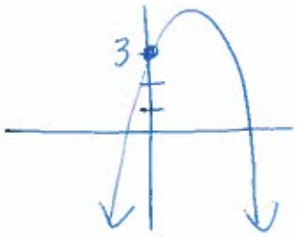
A) Quadratic, one x-intercept, negative Leading coefficient



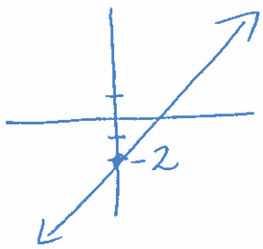
B) Two turning points (one in Q2 and Q4), positive leading coefficient and constant term of -4



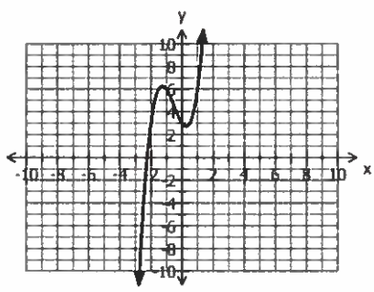
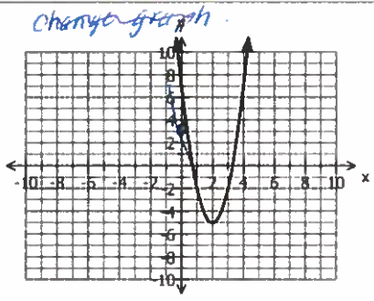
C) Degree 2, one turning point which is a maximum, constant term of 3



D) Degree 1, positive leading coefficient and y-intercept of -2



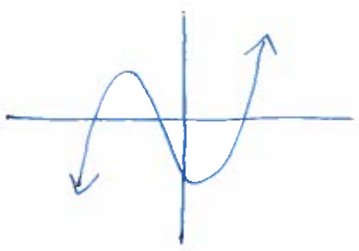
3. Determine the following characteristics for the following polynomials:

Characteristics		change graph 
Degree	3	2
Sign of Leading Coefficient	+	+
Constant term of function	3	~~3~~ 7
End behaviour	Q3 to Q1	Q2 to Q1
y-intercept	$y = 3$	$y = ~~3~~ 7$
Domain	$x \in \mathbb{R}$	$x \in \mathbb{R}$
Range	$y \in \mathbb{R}$	$y \geq -5$

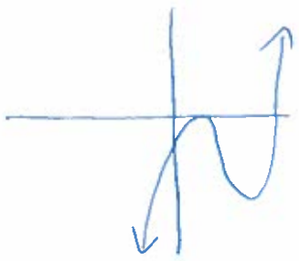
4. Write an equation for a polynomial function that satisfies each set of characteristics:

A) Degree 1, decreasing function, y-intercept of -2	B) One turning point, max value, y-intercept of 3
$y = -3x - 2$	$y = -2x^2 + 3$ ∩
C) Cubic extending from Q2 to Q4, y-intercept of 0	D) Extending from Q2 to Q1, y-intercept of 5, no x-intercept or turning point ⟷
$y = -2x^3 + x^2 + x$	$y = 5$

5. Sketch two possible graphs that are different, yet both are cubic functions with positive leading coefficients and negative y-intercepts. Explain why the graphs you sketched are different.



3 x-ints



2 x-ints

6. The table below shows the birthrate in Canada per 1000 people.

Number of years after 1975	0	5	10	15	16	17	18	19
Birthrate (per 1000 people)	15.3	15.5	14.9	14.3	14.1	13.6	13.3	12.9

When a linear regression is performed on this data, the equation $y = -0.13x + 15.81$ is obtained.

a) What is does the –0.13 represent in this equation?

- the birthrate per year decreases by 0.13.

b) Assuming this trend continues, what will the birthrate in Canada be in 2020?

2020 − 1975 = 45 years

$y = -0.13(45) + 15.81$

$y = -5.85 + 15.81 = 9.96$

c) In what year will the birthrate be 11.2?

$11.2 = -0.13x + 15.81$

$-15.81 \qquad -15.81$

$\frac{-4.61}{-0.13} = \frac{-0.13x}{-0.13}$

$x = 35.5$ years

$\therefore 1975 + 35.5 \approx 2010$,

Two hoses together can fill a pool in 2 hours. If only hose A is used, the pool fills in 3 hours. How long would it take to fill the pool if only hose B is used?

hose A	3	1/3
hose B	x	1/x
Together	2	1/2

$\left[\frac{1}{3} + \frac{1}{x} = \frac{1}{2}\right] \times 6x$

$2x + 6 = 3x$

$2x - 3x = -6$

$-x = -6$

$x = 6$

OR

$\frac{1}{x} = \frac{1}{2} - \frac{1}{3}$

$\frac{1}{x} = \frac{3}{6} - \frac{2}{6}$

$\frac{1}{x} = \frac{1}{6}$

$x = 6$.

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