MCR 3U9 **Semester 1, 2015 - 2016**

Grade 11 AP Mathematics
Unit 3 – Essentials of Polynomial Functions

Mr. N. Nolfi
Victim: Mr. Solutions How do you do it Mr. S.?

KU	APP	COM
21 /26	20 /20	5 /5

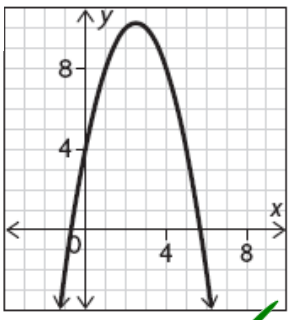
v.2

1. Use end behaviours, turning points and zeros to match each graph to the most likely polynomial equation. **(4 KU)**

~~(a)~~ $y = x^2 + 5x + 4$ ~~(b)~~ $y = 2x^3 - 3x^2 + x - 2$ **(c)** $y = -x^4 + x^3 + x^2 - 2x + 7$ ~~(d)~~ $y = x(2x^3 - 3x^2 + 3)$

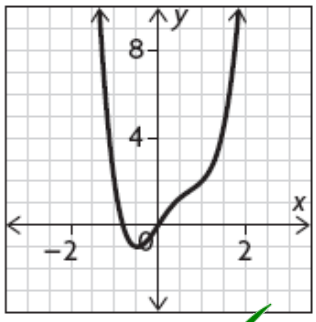
~~(e)~~ $y = -x^2 + 5x + 4$ ~~(f)~~ $y = 2/9(4x-3)(x^2+3)$ **(g)** $y = -7/40(4x+5)(5x-8)(x^2+1)$

A



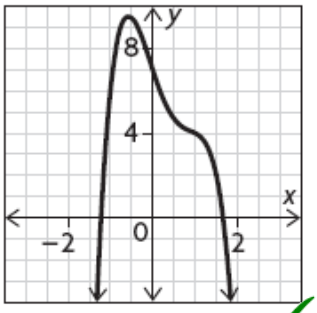
Equation: e ✓

B



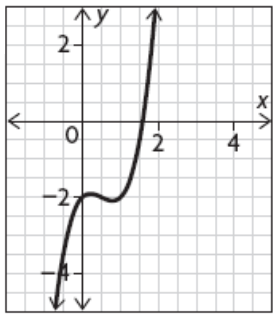
Equation: d ✓

C



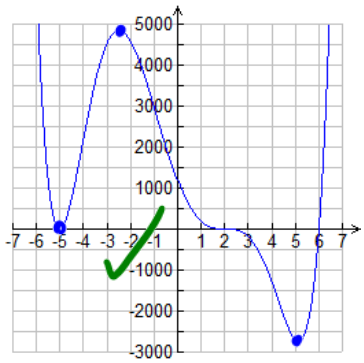
Equation: c or g ✓

D



Equation: b ✓

2. Given below is the graph of the polynomial function $p(x)$. Determine each of the following. **(12 KU)**



(a) ***End Behaviours***

As $x \to \infty$, $y \to$ ∞ ✓

As $x \to -\infty$, $y \to$ ∞ ✓

(b) ***Number of Turning Points*** (Mark the turning points on the graph)

3 ✓

(c) ***Zeros and Multiplicities***

Zero	Multiplicity
−5	2 even ✓
2	3 odd ✓
6	1 ✓

(d) ***Intervals of Increase***

$(-5, -2.5)$ ∪ $(5, \infty)$ ✓

(e) ***Intervals of Decrease***

$(-\infty, -5)$ ∪ $(-2.5, 5)$ ✓

(f) ***Possible Equation of p(x)***

$p(x) = a(x+5)^2(x-2)^3(x-6)$ ✓

for some $a > 0$

3. Given the polynomial function $q(x) = -3x^7 - 9x^4 + 4x^2 + 7x - 3$, determine each of the following. **(10 KU)**

(a) ***End Behaviours***

As $x \to \infty$, $y \to$ −∞ ✓

As $x \to -\infty$, $y \to$ ∞ ✓

(b) ***Number of Possible…***

Zeros: 1 to 7 ✓

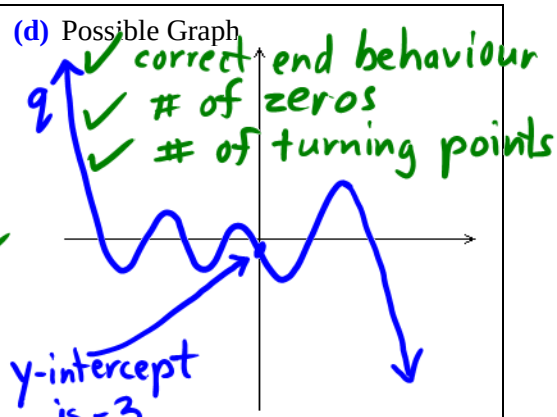
Turning Points: 0, 2, 4, 6 ✓

(c) ***Absolute Max, Min or Neither? Why?***

Neither. ✓

q is an odd-degree ✓ polynomial (which means it has opposite end behaviour)

(d) Possible Graph



(e) ***The y-intercept of q(x)***

$q(0) = -3$ ✓

KU	APP	COM
− 0	− 0	− 0

4. Sketch the graph of $g(x)=-\frac{3}{2}\left(-2(x+1)\right)^3+5$ by applying transformations to the function $f(x)=x^3$. **(9 APP)**

(a) State the transformations required to obtain g from the base/parent/mother function $f(x)=x^3$.

Horizontal	*Vertical*
1. Compress by a factor of $-\frac{1}{2}$ ✓	1. Stretch by a factor of $-\frac{3}{2}$ ✓
2. Translate one unit to the left	2. Translate 5 units up

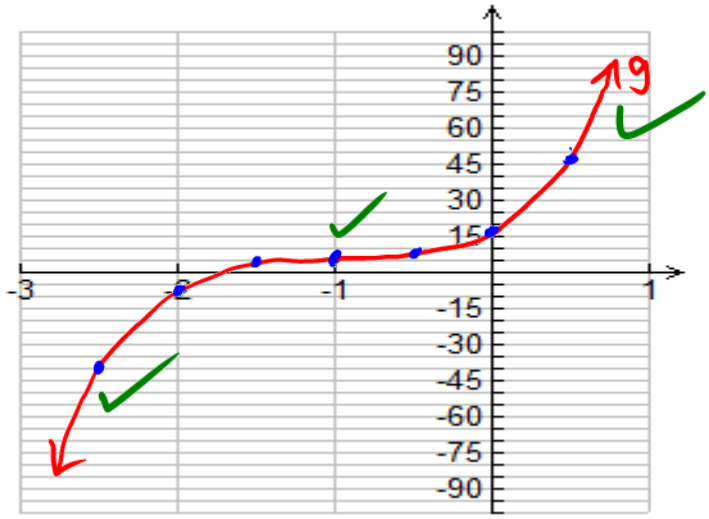
(b) Express the transformation in ***mapping notation***.

$(x,y)\rightarrow\left(-\frac{1}{2}x-1,\ -\frac{3}{2}y+5\right)$ ✓

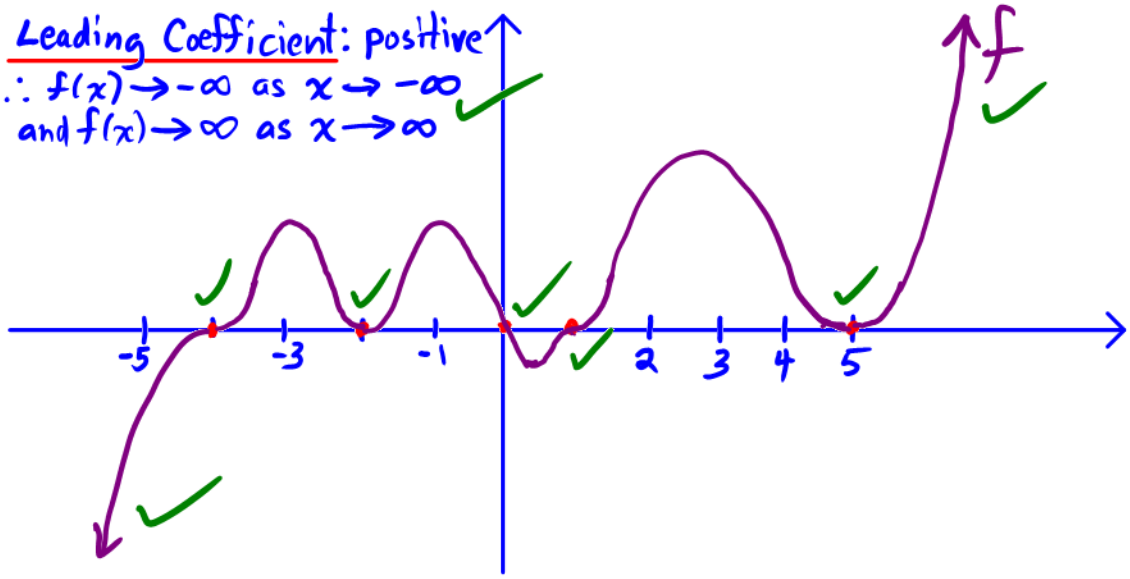
(c) Apply the transformation to a few key points on the graph of the base function $f(x)=x^3$

Pre-image Point on $y=f(x)$	*Image Point* on $y=g(x)$
(0,0)	(−1, 5)
(1, 1)	$(-\frac{3}{2}, \frac{7}{2})$
(−1,−1)	$(-\frac{1}{2}, \frac{13}{2})$ ✓
(2, 8)	(−2,−7)
(−2,−8)	(0, 17)
Rough Work (3, 27)	$(-\frac{5}{2}, -\frac{71}{2})$
(−3,−27)	$(\frac{1}{2}, \frac{91}{2})$

(d) Now sketch the graph of $g(x)$.



5. Sketch a possible graph of $f(x)=x(x-5)^4(x-1)^3(x+4)^3(x+2)^2$.



Zero	Multiplicity
−4	3
−2	2
0	1 ✓
1	3
5	4

Degree of f = 13
→ opposite end behaviours ✓

KU	APP	COM
− 0	− 0	− 0