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

Grade 11 AP Mathematics
Unit 3 – Essentials of Polynomial Functions

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

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

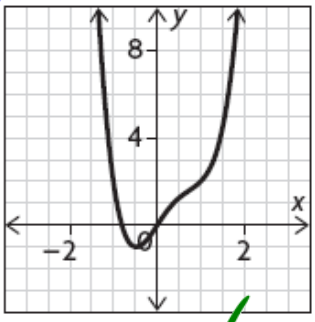
v.1

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) $y=1/3(3x-2)(x^2+3)$ (c) $y=-x^4+x^3+x^2-2x+7$ (d) $y=x(2x^3-3x^2+3)$

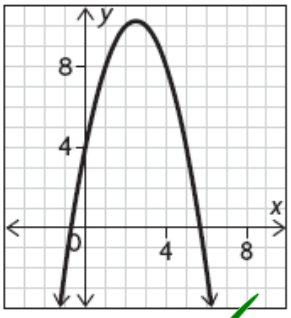
~~(e)~~ $y=x^2+5x+4$ ~~(f)~~ $y=x^3-x^2+x-2$ (g) $y=-7/40(4x+5)(5x-8)(x^2+1)$

A



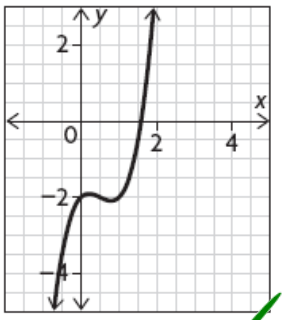
Equation: d ✓

B



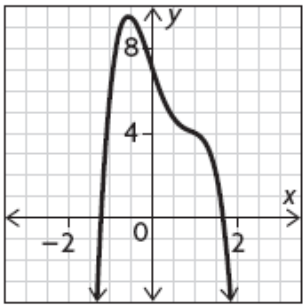
Equation: a ✓

C



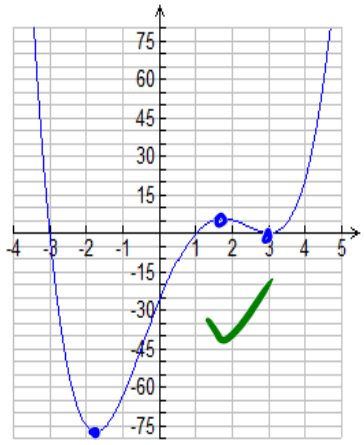
Equation: b ✓

D



Equation: c or g ✓

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
-3	1 ✓
1	1 ✓
3	2 even ✓

(d) *Intervals of Increase*

(-1.8, 1.7) ∪ (3, ∞) ✓

(e) *Intervals of Decrease*

(-∞, -1.8) ∪ (1.7, 3) ✓

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

$p(x)=a(x+3)(x-1)(x-3)^2$ ✓ ✓ ✓

for some $a>0$

3. Given the polynomial function $q(x)=-3x^6-9x^4+4x^2+7x-3$, 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: 0 to 6 ✓

Turning Points: 1, 3, 5 ✓

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

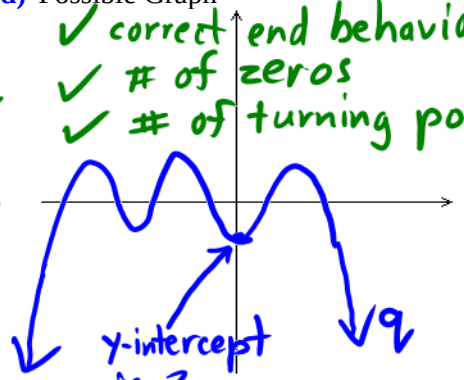
$q(0)=-3$ ✓

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

Absolute max ✓ because as $x\to\pm\infty$, ✓ $y\to-\infty$ (even degree, negative leading ~~coefficient~~)

(d) Possible Graph

✓ correct end behaviour
✓ # of zeros
✓ # of turning points



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 down

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

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

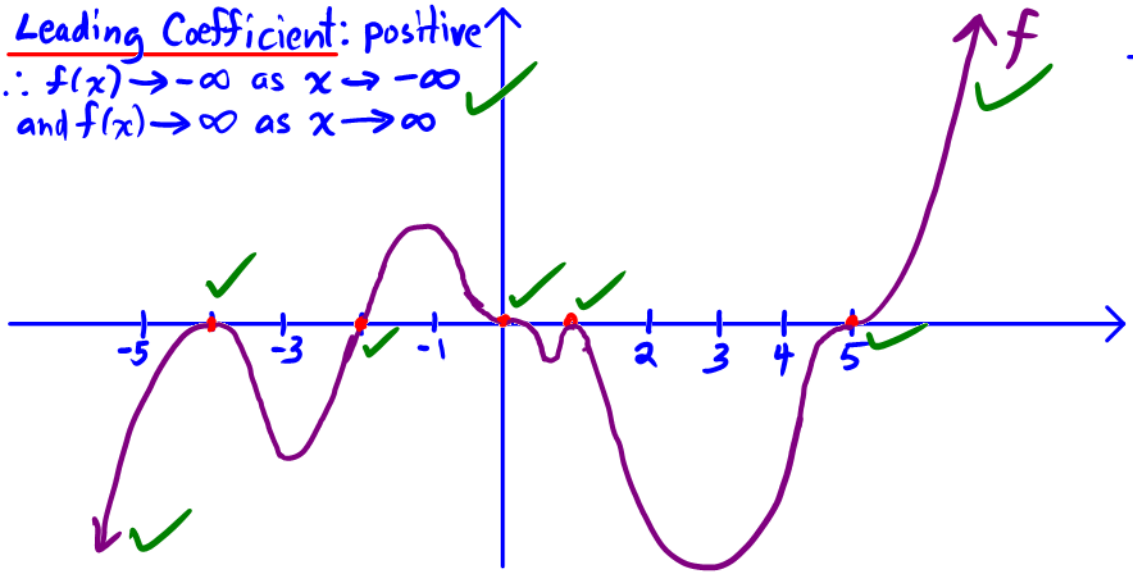
(c) Apply the transformation to a few key points on the graph of the base function $f(x)=x^3$

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

Rough Work

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

5. Sketch a possible graph of $f(x)=x^3(x-5)^3(x-1)^2(x+4)^4(x+2)$. **(11 APP)**



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

Degree of f = 13
→ opposite end behaviours ✓

KU	APP	COM
– 0	– 0	– 0