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CC ALGEBRA 2

TROICI

UNIT 2 REVIEW: SOLIVING POLYNOMIALS

1) Solve the equation by completing the square and leave your answer in *simplest radical form*.

a. $x^2 - 6x - 3 = 0$

$$\frac{x^2 - 6x + 9}{+3 \quad +3} = 3 + \frac{9}{+3}$$

$$\sqrt{(x-3)^2} = \sqrt{12}$$

$$\boxed{x-3 = \pm 2\sqrt{3}}$$

$$\boxed{x = 3 \pm 2\sqrt{3}}$$

Solve the equation by completing the square.

b. $3x^2 - 9x = -6$

$$3x^2 - 9x + 6 = 0$$

$$\frac{x^2 - 3x + 2}{3} = 0$$

$$x^2 - 3x + \frac{9}{4} = -2 + \frac{9}{4}$$

$$\sqrt{\left(x - \frac{3}{2}\right)^2} = \sqrt{\frac{1}{4}}$$

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

$$+ \frac{3}{2} \quad + \frac{3}{2}$$

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

$$x = \frac{4}{2} \text{ or } \boxed{2}, \frac{2}{2} \text{ or } \boxed{1}$$

2) Solve the following equation using the quadratic formula to the simplest radical form.

$$3x^2 - 3x + 7 = 9x + 3$$

$$-9x - 3 - 9x - 3$$

$$3x^2 - 12x + 4 = 0$$

a=3
b=-12
c=4

$$x = \frac{-(-12) \pm \sqrt{(-12)^2 - 4(3)(4)}}{2(3)}$$

$$x = \frac{12 \pm \sqrt{90}}{6} < \frac{\sqrt{90}}{\sqrt{6}} \quad 4\sqrt{6}$$

$$x = \frac{12 \pm \sqrt{90}}{6}$$

$$\boxed{x = \frac{6 \pm 2\sqrt{6}}{3}}$$

3) Find all solutions to $x^3 + 3x^2 - 9x - 27 = 0$ algebraically and state their multiplicities.

$$\begin{array}{l}
 x^2(x+3) \mid -9(x+3) \\
 (x^2-9)(x+3) \\
 (x+3)(x-3) \mid (x+3) \\
 \hline
 -3 \quad 3 \quad -3
 \end{array}$$

$\{ 3 \text{ mult} + 1, -3 \text{ mult} + 2 \}$

4) Factor each expression COMPLETELY.

a) $x^3 - 125$ SOAP $a = x$
 $b = 5$

$$(a-b)(a^2+ab+b^2)$$

$$\boxed{(x-5)(x^2+5x+25)}$$

b) $2x^4 + 16x$ GCF

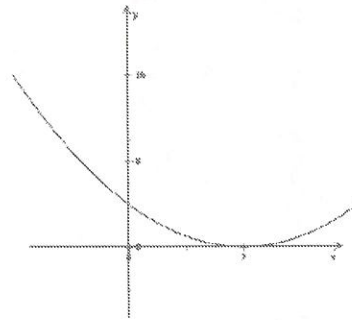
$$2x(\cancel{x^3} + 8)$$
 SOAP! $a = x$
 $b = 2$

$$\boxed{2x(x+2)(x^2-2x+4)}$$

For #5-6, a polynomial function and its graph are given. Answer the questions provided

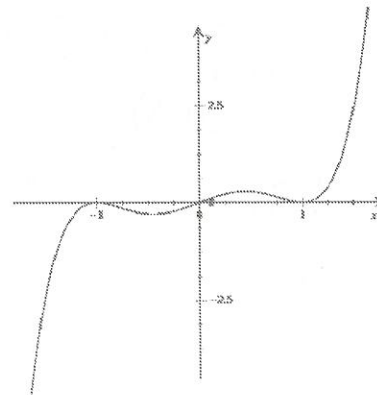
5) $f(x) = (x-2)^2$

- a) State the degree: 2
- b) What are the zero(s)? 2
- c) What is the multiplicity of the root?
2



6) $f(x) = (x+1)^2(x-1)^2x$

- a) State the degree: 5
- b) What are the zeros? -1, 1, 0
- c) What are the multiplicities of each root?
-1 mult + 2
1 mult + 2
0 mult + 1



7) Consider the polynomial function $y = 5 - 3x^2 - 2x^3$.

a) Write the function in standard form. $y = -2x^3 - 3x^2 + 5$

b) What is the degree of this function? 3

c) What is the leading coefficient? -2

d) How many distinct zeros could this function have? 3

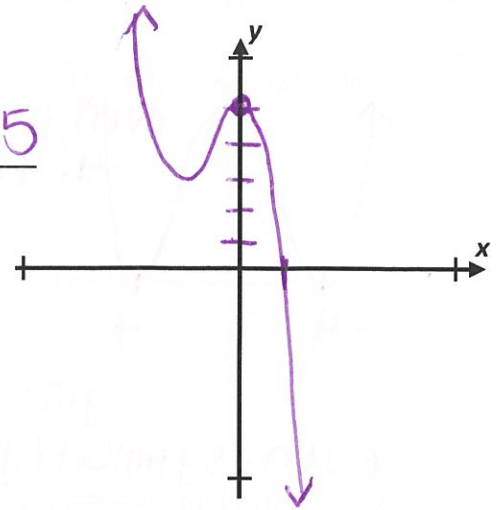
e) What is the end behavior of the graph of this function?

as $x \rightarrow -\infty, f(x) \rightarrow \infty$
as $x \rightarrow \infty, f(x) \rightarrow -\infty$

f) Sketch the function on the graph provided.

e) Is the function odd, even, or neither? Explain.

neither, no symmetry



y int = 5
root = 1 mult 3
↳ use calculator

8) Consider the polynomial function $y = x^4 - 26x^2 + 25$

a) What is the degree of this function? 4

b) What is the leading coefficient? 1

c) How many distinct zeros could this function have? 4

d) Find the zeroes of this function algebraically.

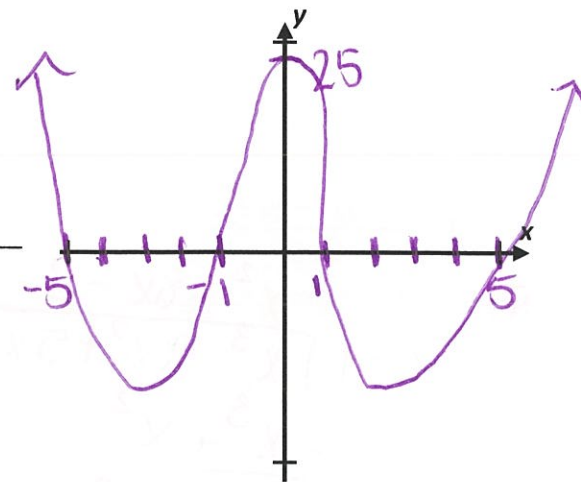
$x^4 - 26x^2 + 25$
 $(x^2 - 25)(x^2 - 1)$
 $(x+5)(x-5)(x+1)(x-1)$
-5 | 5 | -1 | 1 = roots

e) What is the end behavior of the graph of this function?

as $x \rightarrow -\infty, f(x) \rightarrow \infty$
as $x \rightarrow \infty, f(x) \rightarrow \infty$

f) Is the function odd, even, or neither? Explain graphically and justify algebraically.

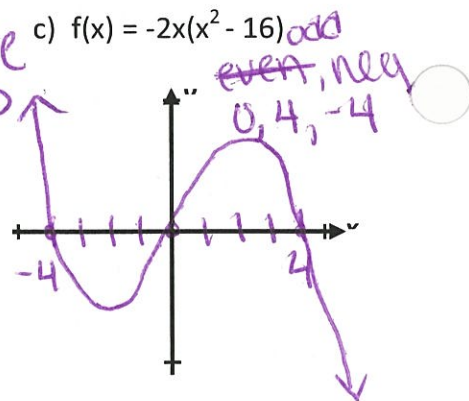
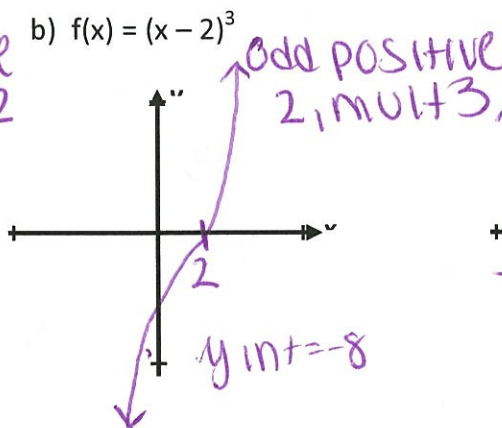
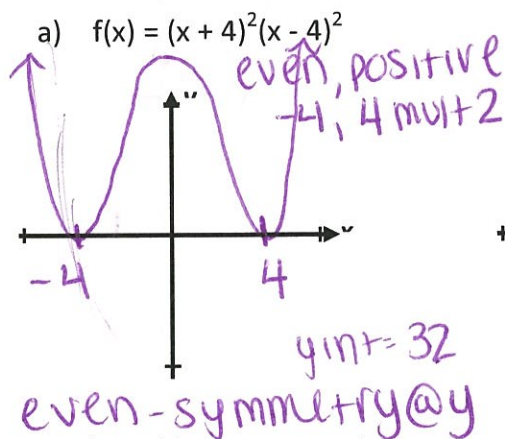
Even, symmetry about the y-axis



y intercept = 25

g) Sketch the function on the graph provided.

9) After sketching the graph, determine if the following functions are even, odd, or neither.



10) For each problem, express the quotient as a polynomial with a remainder as a rational expression.

a) $\frac{3x-9}{x-2}$

$$x-2 \overline{) 3x-9} \\ \underline{-3x+6} \\ -3$$

$\boxed{x+2 + \frac{16}{x-7}}$

b) $\frac{x^2-5x+2}{x-7}$

$$x-7 \overline{) x^2-5x+2} \\ \underline{-x^2+7x} \\ 2x+2 \\ \underline{-2x+14} \\ 16$$

c) $\frac{x^3-9x^2+5x+2}{x-1}$

$$x-1 \overline{) x^3-9x^2+5x+2} \\ \underline{-x^3+x^2} \\ -8x^2+5x+2 \\ \underline{+8x^2-8x} \\ -3x+2 \\ \underline{+3x-3} \\ -1$$

$\boxed{x^2-8x-3 - \frac{1}{x-1}}$

d) $(x^3+5x-8) \div (x+2)$

Fill in terms

$$x+2 \overline{) x^3+0x^2+5x-8} \\ \underline{-x^3-2x^2} \\ -2x^2+5x-8 \\ \underline{+2x^2+4x} \\ 9x-8 \\ \underline{-9x+18} \\ -26$$

$\boxed{x^2-2x+9 - \frac{26}{x+2}}$

11) Determine if the following function is even, odd, or neither. Justify algebraically.

$$g(x) = 2x^3 - 6x$$

$$g(-x) = 2(-x)^3 - 6(-x)$$

$$g(-x) = -2x^3 + 6x$$

\therefore the function is ODD

12) Consider the polynomial function: $P(x) = 2x^3 + 3x^2 - 2x - 3$.

a) Does $P(-1) = 0$? If so, what must one of the factors of P be?

$$P(-1) = 2(-1)^3 + 3(-1)^2 - 2(-1) - 3$$

$$-2 + 3 + 2 - 3 = 0 \checkmark$$

$$\boxed{\text{FACTOR} = x + 1}$$

b) Find the remaining two factors of P .

① Divide

$$\begin{array}{r} 2x^2 + x - 3 \\ x+1 \overline{) 2x^3 + 3x^2 - 2x - 3} \\ \underline{-2x^3 + 2x^2} \\ x^2 - 2x \\ \underline{-x^2 + x} \\ -3x - 3 \\ \underline{+3x + 3} \\ 0 \end{array}$$

② FACTOR RAINBOW!

$$\begin{array}{c} 2x^2 + x - 3 \\ \begin{array}{ccc} 2x & & -3 \\ & + & x \end{array} \end{array}$$

$$2x^2 - 2x + 3x - 3$$

$$2x(x-1) + 3(x-1)$$

$$\boxed{(2x+3)(x-1)}$$

13) Show that $x^{51} - 21x + 20$ is divisible by $x-1$ using the remainder theorem.

$$P(1) = (1)^{51} - 21(1) + 20$$

$$= 1 - 21 + 20$$

$$P(1) = 0 \checkmark \therefore x-1 \text{ is a factor}$$

14) If $3x^3 - 13x^2 + 15x - 7$ is divided by $x-2$, use the remainder theorem to find the remainder.

$$P(2) = 3(2)^3 - 13(2)^2 + 15(2) - 7$$

$$= 24 - 52 + 30 - 7$$

$$P(2) = \boxed{-5 = \text{Remainder}}$$

15) Find the value k so that $(kx^3 + x - k) \div (x+2)$ has remainder of 16.

$$P(-2) = 16$$

$$k(-2)^3 + (-2) - k = 16$$

$$-8k - 2 - k = 16$$

$$-9k - 2 = 16$$

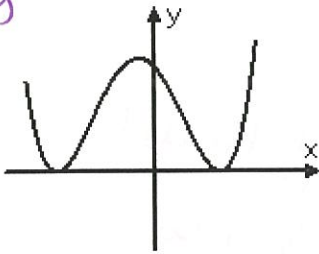
$$-9k = 18$$

$$k = -2$$

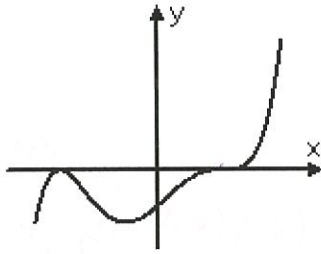
16. Which of the following graphs could represent the polynomial $f(x) = a(x+b)^2(x-c)^3$?

★ Tricky

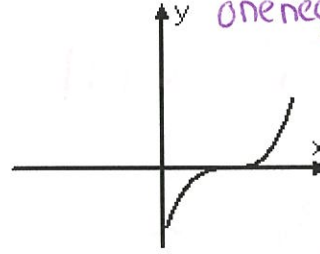
→ FIX!
 degree = 5
 LC = +
 one neg one pos. L → #



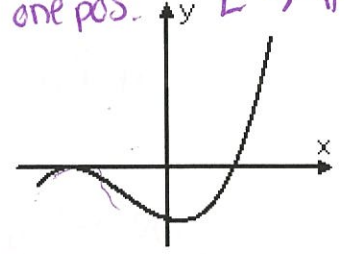
~~(1)~~



(2)



~~(3)~~



(4)

17. Which end behavior is associated with a function that has a leading positive term with an odd exponent?

~~(1) Up/up~~

~~(2) Down/down~~

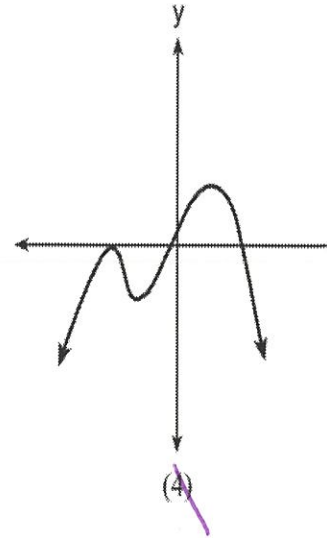
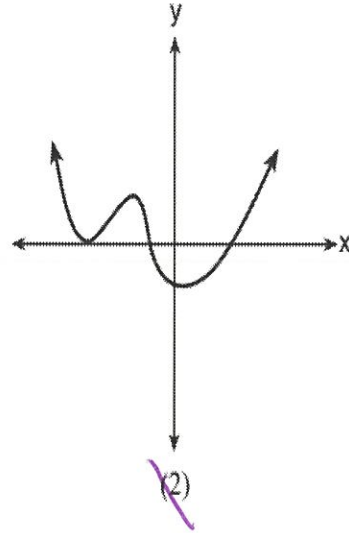
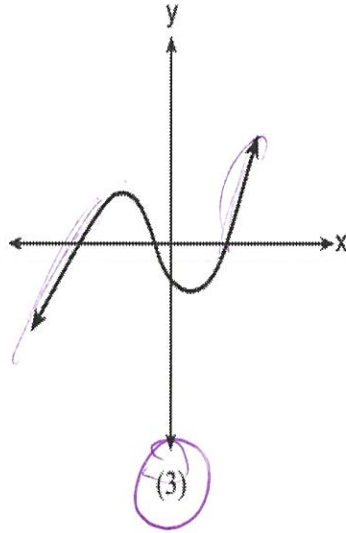
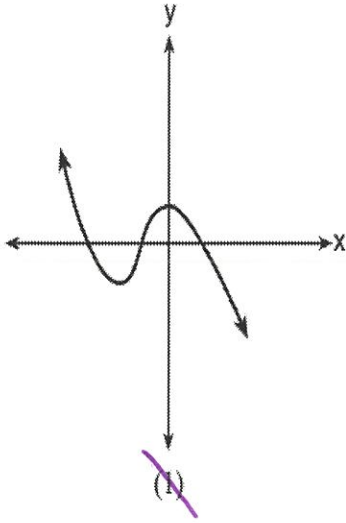
(3) Up/down

(4) Down/up

18.

Which graph has the following characteristics?

- three real zeros
- as $x \rightarrow -\infty$, $f(x) \rightarrow -\infty$
- as $x \rightarrow \infty$, $f(x) \rightarrow \infty$



19. The graph of a polynomial function $f(x)$ is illustrated to the right.

a. What is the remainder when $f(x)$ is divided by $(x - 1)$?

$P(1) = 30$

b. What is the remainder when $f(x)$ is divided by $(x + 3)$?

$P(-3) = 0$

