Acc. PreCalculus Ch. 3 Review Name: _____

NO CALCULATOR Period _____

1. Identify the x- and y-intercepts and the sketch the graph of the following

A) $p(x) = -(x-1)^4$

deg: 4 lc: − both ↓

x = 1 (4 - bounces) y = -1

B) $p(x) = x^3 - 16x$ $x(x-4)(x+4)$

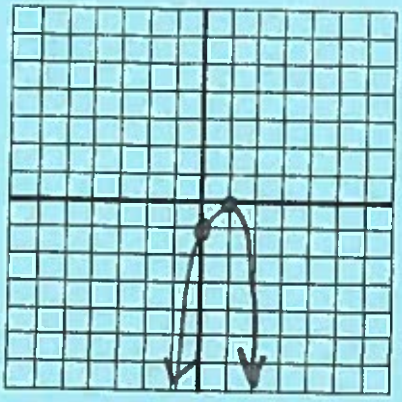
deg: 3 lc: + rt ↑, lft ↓

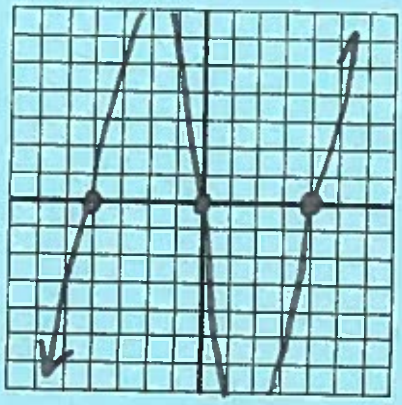
x = 0, 4, -4 y = 0

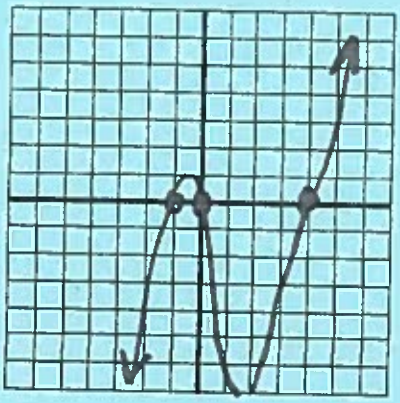
C) $p(x) = x^3 - 3x^2 - 4x$ $x(x-4)(x+1)$

deg: 3 lc: +, rt ↑ left ↓

x = 0, -1, 4 y = 0







2. Write the equation into vertex form and identify the vertex.

A) $p(x) = 2x^2 - 8x - 9$

$2(x^2 - 4x + \underline{4}) - 9 \underline{-8}$

$p(x) = 2(x-2)^2 - 17$ | V: (2, -17)

B) $p(x) = x^2 - 6x + 4$

$(x^2 - 6x + \underline{9}) + 4 \underline{-9}$

$p(x) = (x-3)^2 - 5$ | V (3, -5)

2. Find the max/min point and state if it is a max or min. (vertex form or $x = \frac{-b}{2a}$)

A) $2x^2 + 8x + 7$

$= 2(x^2 + 4x + \underline{4}) + 7 \underline{-8}$

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

min @ -1

B) $-x^2 - 3x$

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

$y = -\left(-\frac{3}{2}\right)^2 - 3\left(-\frac{3}{2}\right)$

$-\frac{9}{4} + \frac{9}{2}\frac{18}{4} = \frac{9}{4}$

Max @ $\frac{9}{4}$

3. Find the remainder and state whether the divisor is a factor.

A) $(x^3 + 2x^2 + 9) \div (x+3)$

-3 | 1 2 0 9

-3 3 -9

1 -1 3 0

R: 0, yes its a factor

B) $(x^3 - x^2 + 11x + 2) \div (x-4)$

4 | 1 -1 11 2

4 12 92

1 3 23 94

R: 94

Not a factor

A) List all possible rational zeros (without testing to see if they actually are zeros). B) Determine the possible number of positive and negative real zeros using Descartes' Rule of Signs.

4. $x^5 - 6x^3 - x^2 + 2x + 18 = 0$

+ − − + +

(-x) − + − − +

possible: $\pm 1, 2, 3, 6, 9, 18$

positive: 2 or 0

negative: 3 or 1

5. $6x^4 + 3x^3 + x^2 + 3x + 4 = 0$

+ + + + +

+ − + − +

possible: $\pm \frac{1, 2, 4}{1, 2, 3, 6}$

$\pm 1, 2, 4, \frac{1}{2}, \frac{1}{3}, \frac{2}{3}, \frac{4}{3}, \frac{1}{4}$

positive: None

negative: 4, 2 or 0

6. Find a polynomial of degree 3 with zeros -1, 2 and 0.

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

$x(x^2-x-2)$

$\boxed{y = x^3 - x^2 - 2x}$

7. Find a polynomial of degree 4 having zeros 3i and 4, with 4 being a double root.

$-3i \quad 4$

$(x-3i)(x+3i)(x-4)(x-4)$

$(x^2+9)(x^2-8x+16)$

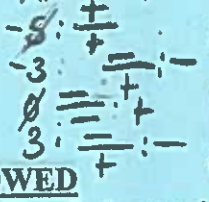
$x^4 - 8x^3 + 16x^2 + 9x^2 - 72x + 144$

$\boxed{y = x^4 - 8x^3 + 25x^2 - 72x + 144}$

8. Solve the inequalities. (Don't forget your number line)

A) $\frac{x^2-16}{x^4-16} < 0$

$\frac{(x-4)(x+4)}{(x-2)(x+2)(x^2+4)} < 0$



$\boxed{(-4,-2) \cup (2,4)}$

B) $-x^2 + 2x + 15 \geq 0$

$x^2 - 2x - 15 \leq 0$

$(x-5)(x+3)$

-5: − · − : +

0: − · + : −

10: + · + : +

$[-3,5]$

CALCULATORS ALLOWED

Find all the rational zeros. Sketch the graph.

9. $P(x) = 2x^3 + 5x^2 - 6x - 9$

$\boxed{x = -3, -1, 3/2}$

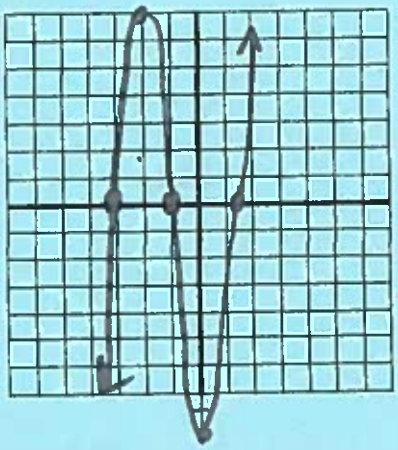
calc → $-3 \mid 2 \quad 5 \quad -6 \quad -9$

$\quad\quad -6 \quad 3 \quad 9$

$\quad 2 \quad -1 \quad -3 \quad 0$

$2x^2 - x - 3$

$(2x-3)(x+1) \quad x = -1, 3/2$



y int: 9

x int: $-3, -1, 3/2$

Find all the real zeros.

10. $P(x) = 3x^3 + 5x^2 - 2x - 4$

$-1 \mid 3 \quad 5 \quad -2 \quad -4$

$\quad\quad -3 \quad -2 \quad 4$

$\quad 3 \quad 2 \quad -4 \quad 0$

$3x^2 + 2x - 4$

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

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

11. $P(x) = 3x^3 - 5x^2 - 8x - 2$

$\frac{1}{3} \mid 3 \quad -5 \quad -8 \quad -2$

$\quad\quad 9 \quad 12$

$\quad 3 \quad 4 \quad 4$

$-1/3 \mid 3 \quad -5 \quad -8 \quad -2$

$\quad\quad -1 \quad 2 \quad 2$

$\quad 3 \quad -6 \quad -6 \quad 0$

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

$x^2 - 2x - 2 = 0$

$\frac{2 \pm \sqrt{4 - 4 \cdot 1 \cdot -2}}{2} = \frac{\sqrt{12}}{2}$

$\frac{2 \pm 2\sqrt{3}}{2} = \boxed{1 \pm \sqrt{3}, -1}$

Find all zeros.

12. $P(x) = x^3 + 25x$

$\boxed{x = 0, \pm 5i}$

$x(x^2 + 25) = 0$

$x^2 + 25 = 0$

$x^2 = -25$

$x = \pm 5i$

13. $P(x) = 3x^5 - 48x$

$3x(x^4 - 16)$

$3x(x^2 - 4)(x^2 + 4)$

$3x(x-2)(x+2)(x^2+4)$

$x = \boxed{0, 2, -2, \pm 2i}$

14. $P(x) = 2x^3 - 8x^2 + 9x - 9$

calc → $3 \mid 2 \quad -8 \quad 9 \quad -9$

$\quad\quad 6 \quad -6 \quad 9$

$\quad 2 \quad -2 \quad 3 \quad 0$

$2x^2 - 2x + 3$

$\frac{2 \pm \sqrt{4 - 4 \cdot 4 \cdot 3}}{4} = \frac{2 \pm \sqrt{-20}}{4}$

$\frac{2 \pm 2i\sqrt{5}}{4}$

$\boxed{x = 3, \frac{1 \pm i\sqrt{5}}{2}}$

15. The profit P (in dollars) generated by selling x units of a certain commodity is given by the function $P(x) = -1500 + 12x - 0.004x^2$ What is the maximum profit, and how many units must be sold to generate it?

$p(x) = -.004x^2 + 12x - 1500$

$x = \frac{-12}{2(-.004)} = 1500$ $\quad y = -.004(1500)^2 + 12(1500) - 1500 = 7500$

Max @ $7500.00 w/ 1500 units sold.

16. Graph each rational function. State all x and y intercepts and any asymptotes. (Horz, Vert, and Slant)

A) $p(x) = \frac{3x^2 - 12}{x+1}$ $\quad 3(x^2-4)$

-1 | 3 0 -12
-3 3
3 -3 -9
$3x - 3$

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

H: ∅
V: x = -1
S: y = 3x - 3
X: ±2
y: -12

B) $p(x) = \frac{1}{(x+2)^2}$

H: y = 0
V: x = -2
S: ∅
X: ∅
y: 1/4

C) $p(x) = \frac{2x}{6-3x}$

H: y = -2/3
V: x = 2
S: ∅
X: 0
y: 0

17. Consider the following rational functions:

$r(x) = \frac{2x-1}{x^2-x-2}$ $\quad (x-2)(x+1)$

H: y = 0
S: ∅
V: x = 2 & x = -1

$s(x) = \frac{x^3+27}{x^2+4}$

H: ∅
S: ∴ yes but I don't wanna find it
V: ∅

$t(x) = \frac{x^3-9x}{x+2}$

H: ∅
S: ∅
V: x = -2

$u(x) = \frac{x^2+x-6}{x^2-25}$ $\quad \frac{(x+3)(x-2)}{(x-5)(x+5)}$

H: y = 1
V: x = 5 & x = -5
S: ∅

A) Which of these rational functions has a horizontal asymptote? r + u
B) Which of these functions has a slant asymptote? S
C) Which of these functions has no vertical asymptote? S
D) List all asymptotes for u(x) (Vertical, Horz, and slant)

H: y = 1 $\quad$ V: x = 5 & x = -5 $\quad$ S: ∅