COLLEGE ALGEBRA **MATH 161** **THOMPSON**

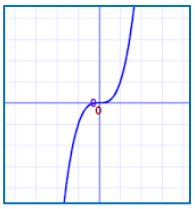
Polynomial Equations

1) Graph the following polynomial function by hand. Then solve the equation and inequalities.

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

(a) $P(x) = 0$ **(b)** $P(x) < 0$ **(c)** $P(x) > 0$

$y = x^3$



open circles < open circles >

A. B. C. D.

(a) The solution set for $P(x) = 0$ is $\{-2, 1, 2\}$.
(Use a comma to separate answers as needed.)

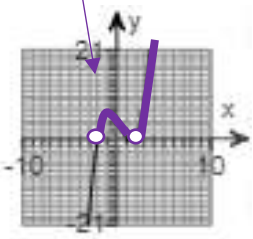
Switch the signs (x-2)(x-1)(x+2)

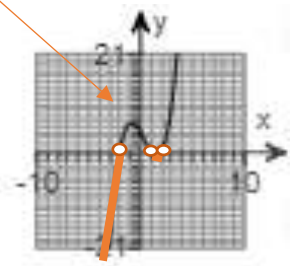
(b) The solution set for $P(x) < 0$ is $(-\infty, -2) \cup (1, 2)$.
(Type your answer in interval notation.)

graph is BELOW the x-axis NOT including zero

(c) The solution set for $P(x) > 0$ is $(-2, 1) \cup (2, \infty)$.
(Type your answer in interval notation.)

Where the graph is ABOVE the x-axis
NOT including zero





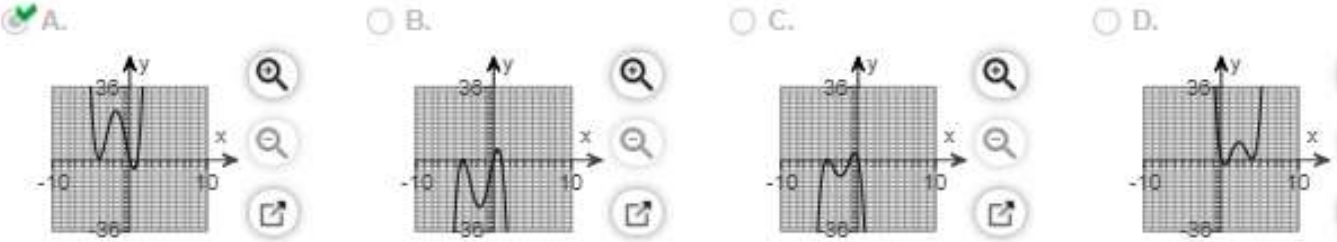
2a) Graph the following polynomial function by hand. Then solve the equation and inequalities.

$P(x) = x^4 + 7x^3 + 8x^2 - 16x$
$= x(x-1)(x+4)^2$

(a) $P(x) = 0$ **(b)** $P(x) \geq 0$ **(c)** $P(x) \leq 0$

closed circles ≥ closed circles ≤

A. B. C. D.



(a) The solution set for $P(x) = 0$ is $\{-4,0,1\}$.
(Use a comma to separate answers as needed.)

Switch the signs $x(x-1)(x+4)^2$ *single x =0*

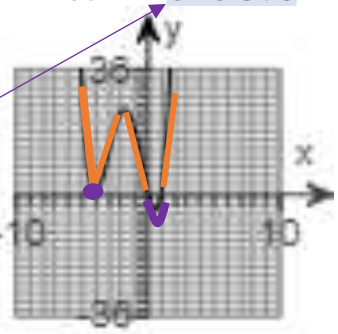
graph is ABOVE the x-axis including zero

(b) The solution set for $P(x) \geq 0$ is $(-\infty,0]\cup[1,\infty)$.
(Type your answer in interval notation.)

(c) The solution set for $P(x) \leq 0$ is $\{-4\}\cup[0,1]$.
(Type your ans

graph is BELOW the x-axis including zero
including the point x = 4

braces {} for
single number



USE U SUBSTITUTION FOR X

3) $x^4 - 10x^2 + 9 = 0$ factor and take half of 1st exponent

$u = x^2$ $u^2 - 10u + 9 = 0$

$(u-9)(u-1)=0$

$u = 9, 1$

$x^2 = 9$ $x^2 = 1$

$x = \sqrt{9}$ $x = \sqrt{1}$

the solution set is -3,3,-1,1

4) $8x^4 - 2x^2 - 1 = 0$

$u = x^2$ $8u^2 - 2u - 1 = 0$ *use slide and divide*

$u^2 - 2u - 8 = 0$

$(u-4)(u+2)=0$ *divide both by 8*

$u = \frac{1}{2}, -\frac{1}{4}$ *can't take square root of a negative number*

$x^2 = \frac{1}{2}$ ~~$x^2 = -\frac{1}{4}$~~

$x = \sqrt{\frac{1}{2}} \rightarrow \sqrt{\frac{1}{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \pm\frac{\sqrt{2}}{2}$

5) $x^6 - 26x^3 - 27 = 0$ $u=x^3$ $u^2-26u-27=0$ take half of 1st exponent

$(u-27)(u+1)=0$ set both equal to zero

$u = -1,27$

$x^3 = -1$ $x^3 = 27$

the solution set is -1,3

6) $(x+2)^2 + 9(x+2) + 14 = 0$ u is always the middle term

$u= x+2$ $u^2+9u+14=0$

$(u+7)(u+2)=0$

$u = -7,-2$ PUT X BACK IN FOR U

$x+2 = -7$ and $x + 2 = -2$

the solution set is -9, -4

7) $(x^2 - 2x)^2 - 27(x^2 - 2x) + 72 = 0$ u is always the middle term

Let u $x^2 - 2x$ then the equation in us is $u^2-27u+72=0$

$(u-3)(u-24)=0$

$u = 3, 24$

$x^2 - 2x = 3$ and $x^2 - 2x = 24$

$x^2 - 2x - 3 - 0$ and $x^2 - 2x - 24 = 0$

$(x-3)(x+1)=0$ and $(x-6)(x+4)=0$

the solution set is 3, -1, 6, -4

8) $(2x+4)^2 + 4(2x+4) + 4 = 0$ u is always the middle term

$u=2x+4$ the given equation with correct substitution is $u^2+4u+4=0$

*if nothing is in front of the middle term just use u $(u+2)(u+2)=0$

$u = -2$

$2x+4 = -2$

the solution set is -3

9) $(x+8)^2+10(x+8)+9=0$ u is always the middle term

u=x+8 the given equation with correct substitution is $u^2+10u+9=0$

*if nothing is in front of the middle term just use u $(u+9)(u+1)=0$

$u=-9,-1$

$x+8=-9$ and $x+8=-1$

the solution set is -17, -9

10) $2(s+7)^2-13(s+7)=7$ u= s+7 $2u^2-13u-7=0$ *slide and divide*

$u^2-13u-14=0$

$(u-14)(u+1)=0$ divide by 2

$u=7,\frac{-1}{2}$

$s+7=7$ and $s+7=\frac{-1}{2}$

the solution set is $0,-\frac{15}{2}$

11) $y=(x+2)^2-11(x+2)+28$ u= x+2 $u^2-11u+28=0$

$(u-7)(u-4)=0$

$u=7,4$

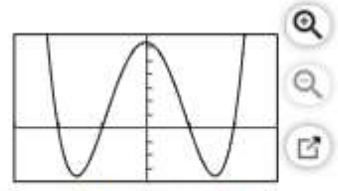
$x+2=7$ and $x+2=4$

$x=5,2$

the x-intercepts are 5, 2

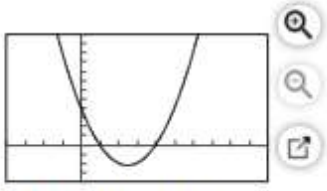
Choose the correct graph below. look at the x-intercepts to find graph

A.



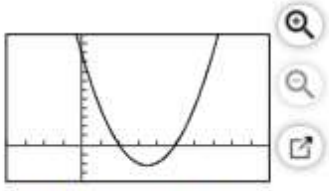
[−6,6,2] by [−40,70,10]

B.



[−4,10,1] by [−4,12,1]

C.



[−4,10,1] by [−4,12,1]

12) $6(x+2)+5a(x+2)$ Factor out the $(x+2)$

$(x+2)(6+5a)$

13) $5x(8x^6+9)-4(8x^6+9)$ Factor out the $(8x^6+9)$

$(8x^6+9)(5x-4)$

14) $3x^2+4xy+6x+8y$ Factor by grouping: take GCF from each highlighted part

$x(3x+4y)+2(3x+4y)$ then factor out the $(3x+4y)$

$(3x+4y)(x+2)$

15) $3x^2+3xy-7x-7y$ Factor GCF from each highlighted part

$3x(x+y)-7(x+y)$ then factor out the $(x+y)$

$(x+y)(3x-7)$

16) Watch the section lecture video and answer the question listed below. Note: The counter in the lower right corner of the screen displays the Example number.

As shown in Examples 1-3, what two things have to be true in order to use the zero factor property?

Click here to watch the video.

Select all that apply.

- [ ] A. Both sides of the equation must be a polynomial.
- [ ] B. One side of the equation must be a polynomial not in factored form.
- [x] C. One side of the equation must be a factored polynomial.
- [x] D. One side of the equation must be zero.
- [ ] E. One side of the equation must be one.

17) Find real solutions by factoring $x^3-36x=0$

Real solutions means set each $x(x^2-36)=0$ factor out x first

$x(x+6)(x-6)=0$ factor difference of two squares

$x=0, x+6=0, x-6=0$

$0,-6,6$

18) Find real solutions by factoring $5x^3 = 2x^2$ move everything to the left

$5x^3 - 2x^2 = 0$ Factor out x^2

$x^2(5x-2)=0$ set each part =0

$0, \frac{2}{5}$

19) Find real solutions by factoring $x^3 - 13x^2 + 42x = 0$

$x(x^2-13x+42)=0$ factor out x first then trinomial

$x(x-7)(x-6)=0$ set each part =0

$0,6,7$

20) Find real solutions by factoring $x^3 - x^2 - x + 1 = 0$

Factor GCF from each highlighted part $x^2(x-1) - 1(x-1)=0$

$(x^2-1)(x-1)=0$

$(x+1)(x-1)(x-1)=0$

do not duplicate answers the solution set is $-1,1$

21) Find real solutions by factoring $x^3 - 8x^2 - 9x + 72 = 0$

Factor GCF from each highlighted part $x^2(x-8) - 9(x-8)=0$

Factor out the (x-8) $(x^2- 9)(x-8)=0$

Factor difference of two squares $(x+3)(x-3)(x-8)=0$

do not duplicate answers the solution set is $-3,3,8$

22) Find real solutions by factoring $2x^3 + 16 = x^2 + 32x$ move everything to the left

Factor GCF from each highlighted part $2x^3 - x^2 - 32x + 16=0$

Factor out the (6x-5) $x^2(2x - 1) - 16(2x - 1)=0$

$(x^2-16)(2x-1)=0$

Factor difference of two squares $(x+4)(x-4)(2x-1)=0$

$x+4=0 \quad x-4=0 \quad 2x-1=0$

the solution set $-4,4,\frac{1}{2}$