

Pre Calculus Ch 2 Practice Test

Name: KEY

You must show ALL of your work to get full credit!

1. Find the vertex, x and y intercepts of  $f(x) = x^2 + 6x + 5$

$$x = \frac{-b}{2a} = \frac{-6}{2} = -3$$

$$f(-3) = 9 - 18 + 5$$

$$\begin{aligned} 0 &= x^2 + 6x + 5 \\ 0 &= (x+5)(x+1) \\ x+5 &= 0 \quad x+1 = 0 \\ x &= -5 \quad x = -1 \end{aligned}$$

Vertex (-3, -4)

x-intercept(s) -5, -1

y-intercept 5

2. Write an equation for a parabola that has a vertex at  $(-2, 4)$  and passes through the point  $(1, 10)$

$$y = a(x+2)^2 + 4$$

$$10 = a(1+2)^2 + 4$$

$$10 = 9a + 4$$

$$6 = 9a$$

$$\frac{6}{9} = a$$

$$\frac{2}{3} = a$$

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

3. Given the polynomial  $f(x) = 2x^6 + 4x^3 - 2x^2 + 6$

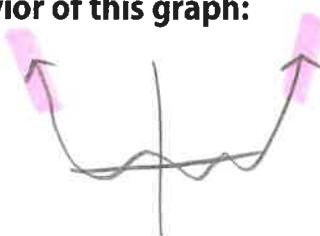
a. What is the maximum number of zeros  $f(x)$  could have? 6

b. What is the maximum number of turning points? 5

c. Sketch the end behavior of this graph:

Both ends

go up.



4. Given one zero is  $x=3$ , Find the real zeros of  $f(x) = x^3 - 12x^2 + 27x$

$$\begin{array}{r} 3 | 1 & -12 & 27 & 0 \\ & 3 & -27 & 0 \\ \hline & 1 & -9 & 0 & 0 \end{array} \quad \begin{aligned} (x-3)(x^2-9x) &= 0 \\ (x-3)(x)(x-9) &= 0 \end{aligned} \quad x = \underline{3, 0, 9}$$

$$x^2 - 9x$$

$$x-3=0 \quad x=0 \quad x-9=0$$

5. Divide using long division:  $(4x^3 - 7x^2 - 11x + 5) \div (4x + 5)$

$$\begin{array}{r}
 x^2 - 3x + 1 \\
 4x+5 \overline{)4x^3 - 7x^2 - 11x + 5} \\
 \underline{(4x^3 + 5x^2)} \\
 -12x^2 - 11x + 5 \\
 \underline{-(-12x^2 - 5x)} \\
 4x + 5 \\
 \underline{- (4x + 5)} \\
 0
 \end{array}$$

$$q(x) = x^2 - 3x + 1$$

$$r(x) = 0$$

6. Divide using synthetic division:  $(5x^3 + 6x^2 + 8) \div (x + 2)$

$$\begin{array}{r}
 5 \quad 0 \quad 6 \quad 8 \\
 \underline{-2} \quad \underline{-10} \quad \underline{20} \quad \underline{-52} \\
 5 \quad -10 \quad 26 \quad -44
 \end{array}$$

$$q(x) = 5x^2 - 10x + 26$$

$$r(x) = -44$$

7. Use synthetic division (remainder theorem) to evaluate  $f(-3)$  for

$$f(x) = 3x^4 - 6x^2 + 5x - 1$$

$$\begin{array}{r}
 3 \quad 0 \quad -6 \quad 5 \quad -1 \\
 \underline{-3} \quad \underline{-9} \quad \underline{27} \quad \underline{-63} \quad \underline{174} \\
 3 \quad -9 \quad 21 \quad -58 \quad 173
 \end{array}$$

$$f(-3) = 173$$

8. Verify  $(x - 1)$  is a factor of  $f(x) = 3x^3 + 2x^2 - 3x - 2$ . Then factor completely

to find all zeros.

$$\begin{array}{r}
 3 \quad 2 \quad -3 \quad -2 \\
 \underline{3} \quad \underline{\frac{2}{3}} \quad \underline{-\frac{3}{5}} \quad \underline{-\frac{2}{2}} \\
 3 \quad 5 \quad 2 \quad 0 \leftarrow
 \end{array}$$

$f(x) = (x-1)(3x^2 + 5x + 2)$

$(x-1)(3x+2)(x+1) = 0$

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

$x-1=0 \quad 3x+2=0 \quad x+1=0$

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

9. Write the equation (you can keep it in factored form) for the polynomial with the following zeros: 8, -2 (multiplicity of 2), 4

$$f(x) = (x-8)(x+2)^2(x-4)$$

10. Factor completely to find all zeros of  $f(x) = 2x^3 - 3x^2 + 6x - 9$

Method 1

Graph to find one zero then:

$$\begin{array}{r} 1.5 | 2 & -3 & 6 & -9 \\ & \underline{-3} & 0 & 9 \\ & 2 & 0 & 6 & 0 \end{array}$$

$$(x-1.5)(2x^2+6) = 0$$

$$\begin{cases} x-1.5=0 \\ x=1.5 \end{cases}$$

$$\begin{cases} 2x^2+6=0 \\ 2x^2=-6 \\ x^2=-3 \end{cases}$$

$$x = \pm i\sqrt{3}$$

Method 2

Factor by grouping

$$\begin{aligned} f(x) &= x^2(2x-3) + 3(2x-3) \\ (2x-3)(x^2+3) &= 0 \end{aligned}$$

$$2x-3=0 \quad x^2+3=0$$

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

$$\begin{cases} x^2+3=0 \\ x=\pm i\sqrt{3} \end{cases}$$

$$x = \frac{3}{2} \pm i\sqrt{3}$$

11. Find all the zeros of  $f(x) = x^3 - 2x^2 + 25x - 50$  given that one zero is  $5i$

$$(x-5i)(x+5i)$$

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

$$x = \pm 5i, 2$$

$$\begin{array}{r} x-2 \\ \hline x^2+25 | x^3-2x^2+25x-50 \\ \quad -(x^3+25x) \\ \hline \quad -2x^2 \quad -50 \\ \quad -(-2x^2) \quad -50 \\ \hline \quad 0 \end{array}$$

$$x-2=0$$

$$x=2$$

12. Simplify and write in standard form:

a.  $3i(4-5i) = 12i - 15i^2 = 15 + 12i$

$$15 + 12i$$

b.  $\frac{(2+3i)(6+i)}{(6-i)(6+i)} = \frac{12+18i+2i+3i^2}{36-i^2} = \frac{9+20i}{37} = \frac{9}{37} + \frac{20}{37}i$

c.  $4+\sqrt{-25}$   
 $4+5i$

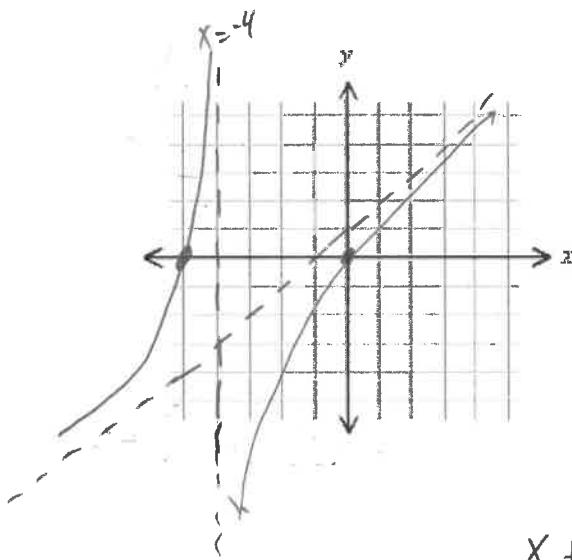
$$4+5i$$

$$\text{Numerator: } x(x^2 + 4x - 5) = x(x+5)(x-1)$$

$$\text{Denom: } (x+4)(x-1)$$

$$f(x) = \frac{x(x+5)(x-1)}{(x+4)(x-1)}$$

13. Identify the following for  $f(x) = \frac{x^3 + 4x^2 - 5x}{x^2 + 3x - 4}$ , then graph



x-intercepts: 0, -5

y-intercept: 0

horiz asymp:

vert asymp:  $x = -4$

oblique asymp:  $y = x + 1$

hole(s): @  $x = 1$

domain:  $\mathbb{R}, x \neq -4, 1$

$$\begin{array}{r} x+1 \\ \hline x^2 + 3x - 4 ) x^3 + 4x^2 - 5x \\ \underline{- (x^3 + 3x^2 - 4x)} \\ \hline x^2 - x \\ \underline{- (x^2 + 3x - 4)} \\ \hline -4x + 4 \end{array}$$