Simplify

- Polynomials
- Radicals
- Powers of i
- Trig
- Trig identities
- Exponent rules
- Average rate of change
- Rational expressions
- Circles

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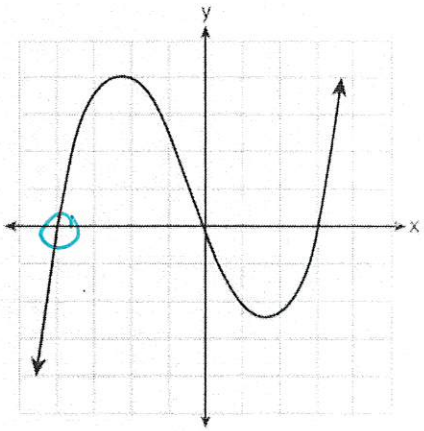
1. The graph of $p(x)$ is shown. What is the remainder when $p(x)$ is divided by $x + 4$? → FACTOR



ROOT → −4

SINCE −4 IS A ROOT FROM THE GRAPH, THE REMAINDER IS ZERO.

a. $x - 4$
b. -4
c. 0
d. 4

2. Write $\sqrt[3]{x} \cdot \sqrt{x}$ as a single term with a rational exponent.

$(x)^{1/3}(x)^{1/2} \rightarrow x^{\frac{1}{3}+\frac{1}{2}} \rightarrow x^{5/6} \rightarrow \sqrt[6]{x^5}$

3. If $\sin^2(32) + \cos^2(x) = 1$, then what does x equal?

PYTHAGOREAN IDENTITY...

$\sin^2 x + \cos^2 x = 1$

SAME → $x = 32$

a. 72
b. 68
c. 58
d. 32

4. Over the set of integers, factor $4x^3 - x^2 + 16x - 4$ completely.

4 TERMS → FACTOR BY GROUPING

$4x^3 - x^2 + 16x - 4$

$x^2(4x - 1) + 4(4x - 1)$

$(4x - 1)(x^2 + 4)$

5. Simplify $xi(x-5i)^2$, where i is the imaginary unit.

$xi(x-5i)(x-5i)$

$xi(x^2-10xi+25i^2)$

$x^3i-10x^2i^2+25xi^3$

$x^3i-10x^2(-1)+25x(-i)$

x^3i+10x^2-25xi

6. Use an appropriate procedure to show that x – 4 is a factor of $f(x) = 2x^3 - 5x^2 - 11x - 4$. Explain your reasoning. $x-4 \rightarrow$ USE 4 FOR SYNTHETIC DIVISION...

4	2	-5	-11	-4
	↓	8	12	4
	2	3	1	0

SINCE THE REMAINDER IS 0, $x-4$ IS A FACTOR OF $f(x)$.

7. Write $(4+3yi)(2-5i)-(4-3yi)(2-5i)$ in $a + bi$ form, where y is a real number.

$(8-20i+6yi-15yi^2)-(8-20i-6yi+15yi^2)$

$(8-20i+6yi+15y)-(8-20i-6yi-15y)$

$8-20i+6yi+15y-8+20i+6yi+15y$

$12yi+30y$

$30y+12yi$

8. Which is a binomial factor of $x^4 - 4x^2 - 4x + 8$?

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

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

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

a. x – 2
b. x + 2
c. x – 4
d. x + 4

* OR GRAPH AND USE TABLE TO VERIFY THE ROOT EQUALS ZERO.

9. Express $(3b)^{\frac{d}{2}}$ in radical form.

$\sqrt[2]{(3b)^d}$

10. Given: $f(x) = 2x^2 + x - 3$ and $g(x) = x - 1$. Express $f(x) \cdot g(x) - [f(x) + g(x)]$ as a polynomial in standard form.

$(2x^2+x-3)(x-1) - [(2x^2+x-3) + (x-1)]$

$2x^3 - 1x^2 - 4x + 3 - [2x^2 + 2x - 4]$

$2x^3 - 1x^2 - 4x + 3 - 2x^2 - 2x + 4$

$2x^3 - 3x^2 - 6x + 7$

	$2x^2$	x	-3
x	$2x^3$	x^2	$-3x$
-1	$-2x^2$	$-x$	$+3$

$2x^3 - 1x^2 - 4x + 3$

11. Which function, f(x) or g(x), has a greater average rate of change on the interval [-2, 4]? *Justify your answer.*

$g(x) = 4x^3 - 5x^2 + 3$

g(x) (FROM TABLE WITH CALCULATOR)

(-2, -49)
(4, 179)

$\frac{179 - (-49)}{4 - (-2)}$

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g(x) HAS A GREATER AVERAGE RATE OF CHANGE.

f(x)

(-2, 1.25)
(4, 80)

$\frac{80 - 1.25}{4 - (-2)}$

13.125

x	f(x)
−4	0.3125
−3	0.625
−2	1.25
−1	2.5
0	5
1	10
2	20
3	40
4	80
5	160
6	320

12. Factor $2d^4 + 6d^3 - 18d^2 - 54d$ completely.

$2d^3(d+3) - 18d(d+3)$

$(d+3)(2d^3 - 18d)$

$(d+3)(2d)(d^2 - 9)$

$(d+3)(2d)(d+3)(d-3)$

13. The equation $4x^2 - 24x + 4y^2 + 72y = 76$ is equivalent to

a. $4(x-3)^2 + 4(y+9)^2 = 76$
b. $4(x-3)^2 + 4(y+9)^2 = 121$
c. $4(x-3)^2 + 4(y+9)^2 = 166$
d. $4(x-3)^2 + 4(y+9)^2 = 436$

$4x^2 - 24x + \_\_ + 4y^2 + 72y + \_\_ = 76 + \_\_ + \_\_$

$4(x^2 - 6x + 9) + 4(y^2 + 18y + 81) = 76 + 36 + 324$

$4(x-3)^2 + 4(y+9)^2 = 436$

* 9 because $(\frac{6}{2})^2$, 36 because $4(9) = 36$

* 81 because $(\frac{18}{2})^2$, 324 because $4(81) = 324$

14. When $g(x)$ is divided by $x + 3$, the remainder is 0. What can you state about $g(-3)$?

IF THE REMAINDER IS 0, THEN $x+3$ IS A FACTOR.

IF $x+3$ IS A FACTOR, THEN $x=-3$ IS A ROOT.

IF $x=-3$ IS A ROOT, THEN $g(-3)$ EQUALS 0.

15. Which binomial is NOT a factor of $x^3 - 11x^2 + 16x + 84$?

a. $x+2$ → SUB $x=-2$ → $y=0$ FACTOR

b. $x+4$ → SUB $x=-4$ → $y=-220$ NOT

c. $x-6$ → $x=6$ → $y=0$ FACTOR

d. $x-7$ → $x=7$ → $y=0$ FACTOR

16. Simplify $(-8)^{\frac{4}{3}}$. *Explain* your steps.

$\sqrt[3]{(-8)^4}$

$(-2)^4$

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FIRST I RE-WROTE AS A CUBE ROOT WITH A FOURTH POWER. THEN I EVALUATED THE CUBE ROOT TO GET -2. LASTLY, I EVALUATED THE FOURTH EXPONENT.

17. Simplify $\frac{4x^3+5x+10}{2x+3}$ $= 2x^2 - 3x + 7 - \frac{11}{2x+3}$

$$
\begin{array}{r}
2x^2 - 3x + 7 \\
2x+3 \overline{)\,4x^3 + 0x^2 + 5x + 10} \\
-(4x^3 + 6x^2) \\
\hline
-6x^2 + 5x \\
-(-6x^2 - 9x) \\
\hline
+14x + 10 \\
-(+14x + 21) \\
\hline
-11
\end{array}
$$

18. Factor $m^5 + m^3 - 6m$ completely.

$m(m^4 + m^2 - 6)$

$m(m^2+3)(m^2-2)$

19. Which expression has been rewritten correctly to form a true statement?

STORE VALUES FOR x & y AND CHECK!

a. $(x+2)^2 + 2(x+2) - 8 = (x+6)x$
b. $x^4 + 4x^2 + 9x^2y^2 - 36y^2 = (x+3y)^2(x-2)^2$
c. $x^3 + 3x^2 - 4xy^2 - 12y^2 = (x-2y)(x+3)^2$
d. $(x^2-4)^2 - 5(x^2-4) - 6 = (x^2-7)(x^2-6)$

20. When is the function $f(x) = \frac{x-3}{x^2+2x-8}$ undefined?

UNDEFINED WHEN $x = -4$ OR $x = 2$

$x^2 + 2x - 8 = 0$

$(x+4)(x-2) = 0$

$x+4=0$ OR $x-2=0$

$x = -4$ OR $x = 2$

21. Divide $\frac{x^3+2x^2+x+6}{x+2}$ $= 1x^2 + 0x + 1 + \frac{4}{x+2}$

$-2 \mid 1 \quad 2 \quad 1 \quad 6$

$\quad\quad\downarrow \quad -2 \quad 0 \quad -2$

$\quad\quad 1 \quad 0 \quad 1 \quad 4$

22. Simplify $\frac{-3x^2-5x+2}{x^3+2x^2}$

$3(-2) = -6$, so... $3x^2 + 6x - 1x - 2$

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

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

$\frac{-1(3x^2+5x-2)}{x^2(x+2)} \rightarrow \frac{-1(x+2)(3x-1)}{x^2(x+2)} \rightarrow -\frac{3x-1}{x^2}$

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

23. What is the quotient when $10x^3 - 3x^2 - 7x + 3$ is divided by $2x - 1$?

a. $5x^2 + x + 3$
b. $5x^2 - x + 3$
c. $5x^2 - x - 3$
d. $5x^2 + x - 3$

$5x^2 + 1x - 3$

$2x-1 \mid 10x^3 - 3x^2 - 7x + 3$

$-(10x^3 - 5x^2)$

$2x^2 - 7x$

$-(2x^2 - x)$

$-6x + 3$

$-(-6x + 3)$

0