

Final Exam Review 4

1.

A. $9m^7 n^{\frac{16}{3}} p^{\frac{19}{3}}$

C. $16x^{\frac{2}{3}}$

E. $2b^{\frac{3}{5}} c^{\frac{1}{5}} d^{\frac{2}{5}}$

B. $2x^{\frac{5}{6}} y^{\frac{2}{6}} z^{\frac{1}{6}}$

D. $3p^{\frac{21}{4}} q^8 r^{\frac{9}{2}}$

F. $4x^2 y^4$

2. A. $8b^{18} d^{23} \sqrt[4]{d}$

C. $\frac{p^{5/2}}{3p(121q^2)^{-1/2}}$

$$\frac{p^{5/2}}{3p(121q^2)^{-1/2}} = \frac{p^{5/2}}{\frac{3}{11} p q^{-1}} = \frac{11 p^{3/2} q}{3}$$

$$\frac{11 p^{3/2} q}{3} = \frac{11 p q \sqrt{p}}{3}$$

D. $\frac{\sqrt[3]{8bc^3 d^4 q}}{2cd^{15} \sqrt[3]{b}}$

E. $\frac{\sqrt[4]{81y^{32} z^{23}}}{3y^{\frac{8}{2}} \sqrt[5]{4} \sqrt[4]{z^3}}$

F. $\frac{\sqrt[2]{100g^{100} f^{45}}}{10g^{50} f^{22} \sqrt{f}}$

G. $\frac{64n^{15} p^{30} q^{21}}{64n^{15} p^7 q^5 \sqrt[4]{p^2 q}}$

H. $\frac{4b^{\frac{3}{2}}}{3b^{-1/2} c^3} = \frac{4b^2}{3c^3}$

Collin
Dillon
Shano
Sung
Sung

$$3. \left(\sqrt[3]{729}\right)^2$$

$$= (9)^2$$

$$= \boxed{81}$$

$$B. \frac{1}{\left(\sqrt[2]{144}\right)^3}$$

$$= \frac{1}{(12)^3} = \boxed{\frac{1}{1728}}$$

$$C. \sqrt[3]{27} \cdot \left(\sqrt[4]{10000}\right)^3$$

$$= 3 \cdot (10)^3$$

$$= 3 \cdot 1000$$

$$= \boxed{3000}$$

$$D. 36^{-1} = \boxed{\frac{1}{36}}$$

$$4. A. 64^{\frac{-4}{3}} = X^{\frac{-3}{4} \cdot \frac{-4}{3}}$$

$$\frac{1}{\left(\sqrt[3]{64}\right)^4} = X$$

$$\frac{1}{(4)^4} = X$$

$$\boxed{\frac{1}{256} = X}$$

$$B. 7X + 8 = 4X - 2$$

$$\begin{array}{r} -4X \\ \hline 3X + 8 = -2 \end{array}$$

$$\begin{array}{r} -8 \\ \hline 3X = -10 \end{array}$$

$$\frac{3X}{3} = \frac{-10}{3}$$

$$\boxed{X = -\frac{10}{3}}$$

$$C. 3X = 4$$

$$\boxed{X = \frac{4}{3}}$$

$$D. 4 + X^{\frac{3}{2}} = 31$$

$$\begin{array}{r} -4 \\ \hline X^{\frac{3}{2}} = 27 \end{array}$$

$$X^{\frac{3}{2} \cdot \frac{2}{3}} = 27^{\frac{2}{3}}$$

$$X = \left(\sqrt[3]{27}\right)^2$$

$$X = (3)^2$$

$$\boxed{X = 9}$$

$$5. A. \frac{S^{\frac{3}{2}}}{S^{\frac{3}{4}}}$$

$$S^{\frac{3}{2} - \frac{3}{4}}$$

$$S^{\frac{6}{4} - \frac{3}{4}}$$

$$\boxed{S^{\frac{3}{4}}}$$

$$B. \frac{S^{\frac{2}{7}}}{S^{\frac{1}{3}}}$$

$$S^{\frac{2}{7} - \frac{1}{3}}$$

$$S^{\frac{6}{21} - \frac{7}{21}}$$

$$S^{-\frac{1}{21}}$$

$$= \boxed{\frac{1}{S^{\frac{1}{21}}}}$$

6. A. $\sqrt[5]{(6x-1)^2} = -1$

$$\frac{-4}{\sqrt[5]{(6x-1)^2}} = \frac{-4}{(4)^5}$$

$$(6x-1)^2 = 1024$$

$$\sqrt{(6x-1)^2} = \sqrt{1024}$$

$$6x-1 = 32$$

$$\begin{array}{r} +1 \\ +1 \\ \hline \end{array}$$

$$\frac{6x}{6} = \frac{33}{6}$$

$$x = \frac{11}{2}$$

B. $\sqrt[4]{(3x+1)^3} - 2 = 6$

$$\frac{-2}{+2} = \frac{6}{+2}$$

$$\sqrt[4]{(3x+1)^3} = (8)^4$$

$$(3x+1)^3 = 4096$$

$$\sqrt[3]{(3x+1)^3} = \sqrt[3]{4096}$$

$$3x+1 = 16$$

$$\begin{array}{r} -1 \\ -1 \\ \hline \end{array}$$

$$\frac{3x}{3} = \frac{15}{3}$$

$$x = 5$$

C. $\sqrt{2x-7} - 20 = -9$

$$\frac{+20}{+20} = \frac{-9}{+20}$$

$$\sqrt{2x-7} = (11)^2$$

$$2x-7 = 121$$

$$\begin{array}{r} +7 \\ +7 \\ \hline \end{array}$$

$$\frac{2x}{2} = \frac{128}{2}$$

$$x = 64$$

7. A. $\frac{81^8 n^8}{81^{\frac{17}{2}} n^{\frac{17}{2}}}$

$$81^{-\frac{1}{2}} n^{-\frac{1}{2}}$$

$$\frac{1}{9n^{\frac{1}{2}}} \text{ or } \frac{1}{9\sqrt{n}}$$

B. $\frac{27^3 r^9 s^3}{27^{\frac{10}{3}} r^{10} s^{\frac{10}{3}}}$

$$27^{-\frac{1}{3}} r^{-1} s^{-\frac{1}{3}}$$

$$\frac{1}{3rs^{\frac{1}{3}}} \text{ or } \frac{1}{3r\sqrt[3]{s}}$$

7C.

$$\frac{100^5 p^{10} q^5}{100^{\frac{11}{2}} p^{11} q^{\frac{11}{2}}}$$

$$100^{-\frac{1}{2}} p^{-1} q^{-\frac{1}{2}}$$

$$\frac{1}{100 p q^{\frac{1}{2}}} \text{ or } \frac{1}{100 \sqrt{q}}$$

8. $(\sqrt[b]{x})^a$

a is the exponent
b is the index

9. $x^{\frac{m}{n}}$

* the exponent becomes the numerator
* the index becomes the denominator.

10. Once you get a common base you can drop the base and work with the exponent only.

11. A. $\frac{625^{9x+3}}{25^{4x}} = 5^8$

B. $\left(\frac{1}{16}\right)^{4x} = 8^{3x-2}$

$$\frac{(5^4)^{9x+3}}{(5^2)^{4x}} = 5^8$$

$$(2^{-4})^{4x} = (2^3)^{3x-2}$$

$$-16x = 9x - 6$$

$$\frac{-9x \quad -9x}{-25x = -6}$$

$$\frac{-25x = -6}{-25 = -25}$$

$$x = \frac{6}{25}$$

$$36x + 12 - 8x = 8$$

$$28x + 12 = 8$$

$$\frac{-12 \quad -12}{28x = -4}$$

$$\frac{28x = -4}{28 \quad 28}$$

$$x = \frac{-1}{7}$$

$$11. D. 8^{4x-2} \cdot 64^{3x-9} = 512^{4x}$$

$$8^{4x-2} \cdot (8^2)^{3x-9} = (8^3)^{4x}$$

$$4x-2 + 6x-18 = 12x$$

$$10x-20 = 12x$$

$$\begin{array}{r} -10x \qquad -10x \\ \hline \end{array}$$

$$\frac{-20}{2} = \frac{2x}{2}$$

$$\boxed{-10 = x}$$

Ignore

$$12. A. \{(9,9) (-8,3) (0,-1)\}$$

$$B. y = \frac{1}{9}x^3$$

$$x = \sqrt[3]{9y}$$

$$C. y = \sqrt{2x-3}$$

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

$$x^2 = 2y-3$$

$$x^2 + 3 = 2y$$

$$\boxed{\frac{x^2 + 3}{2} = y}$$

$$9x = y^3$$

$$\boxed{\sqrt[3]{9x} = y}$$

$$D. y = \frac{x+5}{7}$$

$$E. y = 2x^2 - 1$$

$$x = 2y^2 - 1$$

$$x+1 = 2y^2$$

$$\frac{x+1}{2} = y^2$$

$$\boxed{\pm \sqrt{\frac{x+1}{2}} = y}$$

$$x = \frac{y+5}{7}$$

$$7x = y+5$$

$$\boxed{7x - 5 = y}$$

$$F. y = 3x + 1$$

$$x = 3y + 1$$

$$x - 1 = 3y$$

$$\boxed{\frac{x-1}{3} = y}$$

Imaginary Numbers

1. Simplify each expression.

remember $i^2 = -1$

a. $(2 + 3i) - (-8 - 2i)$

$$2 + 3i + 8 + 2i$$

$$\boxed{10 + 5i}$$

b. $(-3 - 7i) + (-3 - 10i)$

$$-3 - 7i - 3 - 10i$$

$$\boxed{-6 - 17i}$$

c. i^{27}

$$(i^2)^{13} \cdot i$$

$$(-1)^{13} \cdot i$$

$$\boxed{-i}$$

d. $(3 + 2i) - 4i(8i - i^2)$

$$3 + 2i - 32i^2 + 4i^3$$

$$3 + 2i - 32(-1) + 4(-1)i$$

$$3 + 2i + 32 - 4i$$

$$\boxed{35 - 2i}$$

e. i^{208}

$$(i^2)^{104}$$

$$(-1)^{104}$$

$$\boxed{1}$$

f. $(i + 8)^2 - 9i^3$

$$(i + 8)(i + 8) - 9i^3$$

$$i^2 + 16i + 64 - 9i^3$$

$$-1 + 16i + 64 - 9(-1)i$$

$$-1 + 16i + 64 + 9i$$

$$\boxed{63 + 25i}$$

g. $(-4 - 9i)(-5 + 10i)$

$$20 - 40i + 45i - 90i^2$$

$$20 - 40i + 45i - 90(-1)$$

$$20 - 40i + 45i + 90$$

$$\boxed{110 + 5i}$$

h. $i^{83} \cdot 4i^2$

i. $\sqrt{-48}$

$$\sqrt{-1 \cdot 16 \cdot 3}$$

$$\boxed{4i\sqrt{3}}$$

j. $(\sqrt{-25} + 9) - 2i(6i - 9)$

$$5i + 9 - 12i^2 + 18i$$

$$5i + 9 - 12(-1) + 18i$$

$$5i + 9 + 12 + 18i$$

$$\boxed{21 + 23i}$$

k. $\sqrt{-54}$

$$\sqrt{-1 \cdot 9 \cdot 6}$$

$$\boxed{3i\sqrt{6}}$$

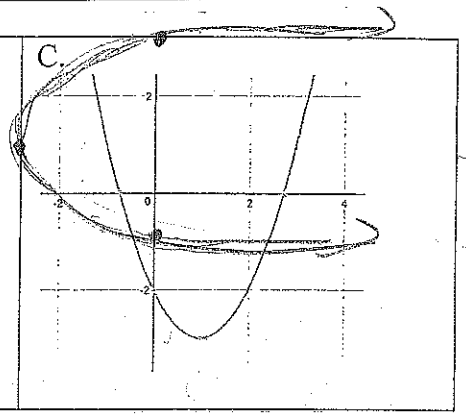
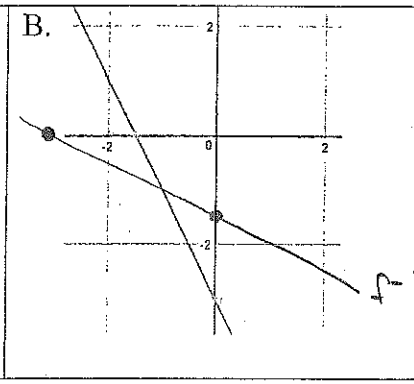
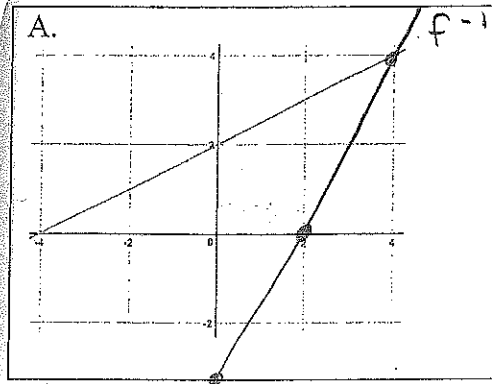
l. $\frac{(7-8i)}{i} \cdot \frac{i}{i}$

$$\frac{7i - 8i^2}{i^2} =$$

$$\frac{7i + 8}{-1}$$

$$\boxed{-7i - 8}$$

17. IGNORE



18. A. $V^W = G$

B. $\log 1000 = 3$

C. $2^3 = 8$

D. $e^x = 9$

E. $\log_4 \frac{1}{4} = -1$

19. A. $\log_3 1 = x$
 $3^x = 1$
 $x = 0$

B. $\log_2 \frac{1}{4} = x$
 $2^x = \frac{1}{4}$
 $2^x = 2^{-2}$
 $x = -2$

C. $\log_3 \frac{1}{3} = x$
 $3^x = \frac{1}{3}$
 $3^x = 3^{-1}$
 $x = -1$

D. $\log_5 125 = x$
 $5^x = 125$
 $5^x = 5^3$
 $x = 3$

E. $\log 100 = x$
 $10^x = 100$
 $10^x = 10^2$
 $x = 2$

20. A. $\log_8 42$

B. $\log_3 \frac{\sqrt[4]{wg}}{z^3}$ or $\log_3 \frac{(wg)^{\frac{1}{4}}}{z^3}$

C. $\frac{\ln 2^6}{4^2} = \frac{\ln 64}{16} = \ln 4$

D. $\log_5 \frac{\sqrt{d}}{c^2 b^2}$

21. A. $\log_5 4 + 3 \log_5 S + \frac{1}{2} \log_5 K$

B. $(5 \log 3 + 5 \log S) - (35 \log r + 10 \log P)$

C. $\frac{1}{2} \log_3 m + \frac{5}{2} \log_3 n$

22. A. $9^{x-2} = 21$
 $x-2 \log 9 = \log 21$
 $x-2 = \frac{\log 21}{\log 9}$
 $x-2 = 1.3856$
 $+2 \quad +2$
 $x = 3.3856$

B. $\log_x 64 = 2$
 $x^2 = 64$
 $x = 8$

D. $\log_4 8 = x+1$
 $4^{x+1} = 8$
 $(2^2)^{x+1} = 2^3$
 $2x+2 = 3$

C. $\frac{13e^{2x}}{13} = \frac{82}{13}$
 $e^{2x} = 6.3077$
 $2x \ln e = \ln 6.3077$
 $2x = \frac{1.8418}{2}$
 $x = .9209$

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

E. $14^{2x-3} = 23$
 $2x-3 \log 14 = \log 23$
 $\frac{2x-3}{\log 14} = \frac{\log 23}{\log 14}$

F. $\log_7 y = 3$
 $7^3 = y$
 $343 = y$

$2x-3 = 1.1881$
 $+3 \quad +3$

G. $\log 2x + \log(x-1) = 3$

$2x = 4.1881$
 $\frac{2x}{2} = \frac{4.1881}{2}$

$\log(2x)(x-1) = 3$
 $\log 2x^2 - 2x = 3$

$x = 2.0941$

$10^3 = 2x^2 - 2x$

H. $\log_y 27 = 3$
 $y^3 = 27$
 $y = 3$

$1000 = 2x^2 - 2x$

$0 = 2x^2 - 2x - 1000$

$0 = 2(x^2 - x - 500)$

↓
 not pretty!!

28. A. $x^3 + 6x^2 - 13x - 42$
 $(2)^3 + 6(2)^2 - 13(2) - 42$
 -36
 not a factor.

B. $(-2)^3 + 6(-2)^2 - 13(-2) - 42$
 0
 yes a factor.

C. $(3)^3 + 6(3)^2 - 13(3) - 42$
 0
 yes a factor

D. $(-3)^3 + 6(-3)^2 - 13(-3) - 42$
 24
 not a factor.

29. A. $x = 0$
 $x = -5$
 $x = 1/2$

B. $x = 0$
 $x = -7$
 $x = 1$
 $x = -1$

C. $x = 0$ mult. 3
 $x = 1$ mult. 2
 $x = -8$

30. $(2x^3 - 3x^2)(4x - 6) = 0$
 A. $x^2(2x - 3) + 2(2x - 3)$
 $(x^2 + 2)(2x - 3) = 0$

actual
root

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

B. $x^4 - 2x^2 + 4 = 0$
 $p = \pm 1, \pm 2, \pm 4$
 $q = \pm 1$

possible roots: $\pm 1, \pm 2, \pm 4$

$p = \pm 1, \pm 2, \pm 3, \pm 6$

$q = \pm 1, \pm 2$

possible roots: $\pm 1, \pm 1/2, \pm 2, \pm 3, \pm 3/2, \pm 6$

31. A. $x^2(x+1)(4x-3)(x-7)$

B. additional roots: $-4i$ and $-2i$
 $(x^2 + 16)(x^2 + 4)$

C. additional roots: $-5i$
 $(x^2 + 25)(x+2)$

32. A. $16x^4 - 81 = 0$
 $(4x^2 - 9)(4x^2 + 9) = 0$
 $(2x - 3)(2x + 3)(4x^2 + 9) = 0$

$x = \frac{3}{2}$	$x = -\frac{3}{2}$	$x = \pm \frac{3i}{2}$
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B. $2x^3 - 7x^2 - 4x = 0$
 $x(2x^2 - 7x - 4) = 0$
 $x(2x + 1)(x - 4) = 0$

$x = 0$	$x = -\frac{1}{2}$	$x = 4$
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C. $3x^4 + x^3 - 2x^2 = 0$
 $x^2(3x^2 + x - 2) = 0$
 $x^2(3x - 2)(x + 1) = 0$

$x = 0$ mult. 2	$x = \frac{2}{3}$	$x = -1$
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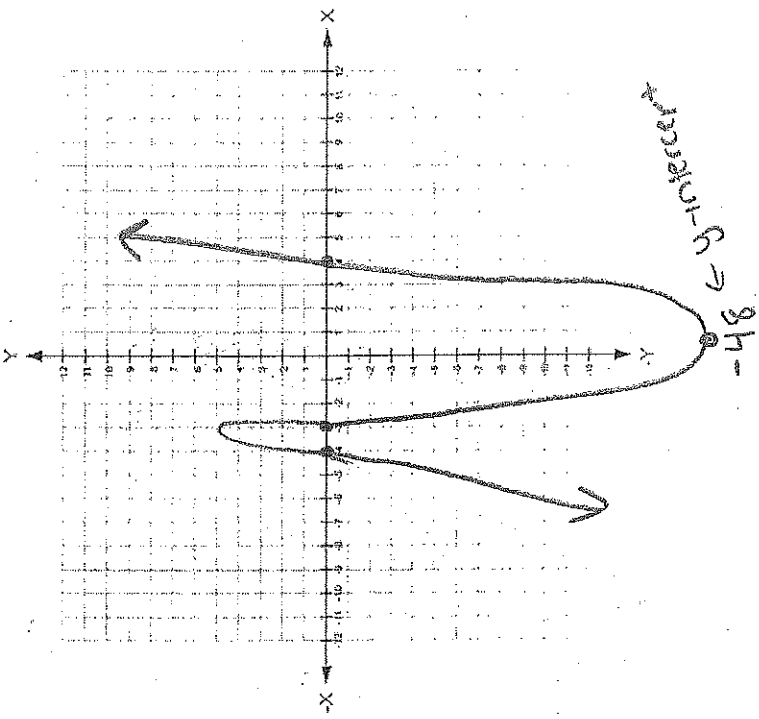
	Left Behavior	Right Behavior
33. A.	$\uparrow \downarrow$	Leading Coeff
B.	$\downarrow \downarrow$	$+$ \nearrow
C.	$\downarrow \nearrow$	$-$ \searrow
D.	$\uparrow \nearrow$	
	<u>Degree</u>	
	<u>Odd</u> : opposite right behavior.	
	<u>Even</u> : same as right behavior	

34. C "bounce"

35. O

36. $\frac{(-2)^4 + 2(-2)^2 - 9}{\text{remainder} = 15}$

Equation	Sign of Leading Coefficient	Degree	End Behavior	x-intercepts				y-intercept
$(x^3 + 3x^2)(16x - 48) = 0$ <u>Factored Form:</u> $x^2(x+3) - 16(x+3) = 0$ $(x^2 - 16)(x+3) = 0$ $(x-4)(x+4)(x+3) = 0$ $x=4 \quad x=-4 \quad x=-3$	pos +	3 odd	↙ ↗	X = -4	X = -3	X = 4	X =	(0, -48)
				EX P O N E N T	EX P O N E N T	EX P O N E N T	EX P O N E N T	
				B W C	B W C	B W C	B W C	



Equation	Sign of Leading Coefficient	Degree	End Behavior	x-intercepts				y-intercept
$x^4 - 13x^2 + 36 = 0$ Factored Form: $(x^2 - 9)(x^2 - 4) = 0$ $(x-3)(x+3)(x-2)(x+2) = 0$ $x=3 \quad x=-3 \quad x=2 \quad x=-2$	+	4 even	↖ ↗	X = -3	X = -2	X = 2	X = 3	(0, 36)
				EXPONENT	EXPONENT	EXPONENT	EXPONENT	
				B W C	B W C	B W C	B W C	

Graph:

