

Name _____
Date _____

Introduction to Technical Mathematics
Class #16 – Review #1

Final Exam Review – Day 1-1

Section 1. Showing all work, partial credit can be given.

1. Solve for x: $6x - 35 = -5$
 $\quad \quad \quad +35 \quad +35$
 $\quad \quad \quad 6x = 30$
 $\quad \quad \quad x = 5$ 1. _____

2. Solve for x: $(x + 4) - (x - 5) + x = 10$
 $\quad \quad \quad x + 4 - x + 5 + x = 10$
 $\quad \quad \quad x + 9 = 10$
 $\quad \quad \quad -9 \quad -9$
 $\quad \quad \quad x = 1$ 2. _____

3. Solve for x: $5(x - 4) = \frac{8 - 2x}{6}$
 $\quad \quad \quad 5x - 20 = \frac{8 - 2x}{6}$
 $\quad \quad \quad \frac{5x - 20}{1} = \frac{8 - 2x}{6}$
 $\quad \quad \quad 5x - 20 = 30x - 120$
 $\quad \quad \quad +2x \quad +2x$
 $\quad \quad \quad 8 = 32x - 120$
 $\quad \quad \quad +120 \quad +120$
 $\quad \quad \quad 128 = 32x$
 $\quad \quad \quad 4 = x$ 3. _____

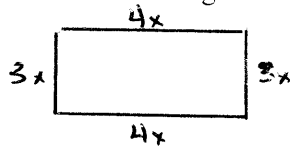
4. Solve for x: $ax + b = cx + d$
 $\quad \quad \quad -cx \quad -cx$
 $\quad \quad \quad ax - cx + b = d$
 $\quad \quad \quad \quad \quad -b \quad -b$
 $\quad \quad \quad ax - cx = d - b$
 $\quad \quad \quad x(a - c) = d - b$
 $\quad \quad \quad x \frac{(a - c)}{(a - c)} = \frac{d - b}{(a - c)}$
 $\quad \quad \quad x = \frac{d - b}{(a - c)}$ 4. _____

5. Solve for x: $\frac{ax + b}{c} = \frac{cx}{d}$
 $\quad \quad \quad \frac{adx + b}{c} = \frac{cx}{d}$
 $\quad \quad \quad adx + b = \frac{cx}{d}$
 $\quad \quad \quad adx = \frac{cx}{d} - b$
 $\quad \quad \quad -cx \quad -cx$
 $\quad \quad \quad x(ad - c) = \frac{0}{(ad - c)}$
 $\quad \quad \quad x = \frac{0}{(ad - c)}$ 5. _____

6. Solve for x: $a(b + cx) = dx$
 $\quad \quad \quad ab + acx = dx$
 $\quad \quad \quad -acx \quad -acx$
 $\quad \quad \quad ab = dx - acx$
 $\quad \quad \quad \frac{ab}{(d - ac)} = \frac{x(d - ac)}{(d - ac)}$
 $\quad \quad \quad \frac{ab}{(d - ac)} = x$ 6. _____

Final Exam Review – Day 1-2

7. The perimeter of a rectangle is 560 in. The ratio of the width to the length of 3 : 4. Find the length and width of the rectangle



$$P = 3x + 3x + 4x + 4x$$

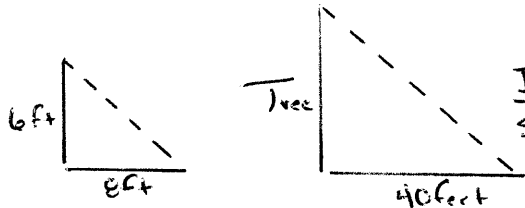
$$\frac{560}{14} = \frac{14x}{14}$$

$$40 = x$$

Width = $3x = 0 \text{ in}$ 7. 160 in

Length = $4x = 160 \text{ in}$

8. A tree casts a shadow on the ground that is measured to stretch 40 feet from the base of the tree. At the same time, a 6 ft tall man casts a shadow on the ground that is 8 feet long. How tall is the tree?



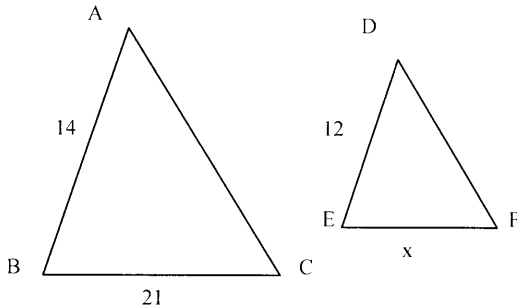
$$\frac{\text{Tree}}{\text{Shadow}} = \frac{6}{8} = \frac{x}{40}$$

$$8x = 240$$

$$x = 30 \text{ feet}$$

8. 30 feet

9. $\triangle ABC$ is similar to $\triangle DEF$. Find the value of x in the diagram.



$$\frac{14}{21} = \frac{12}{x}$$

$$14x = 252$$

$$x = 18$$

9. 18

10. Convert 5.25 feet to cm.

$$\frac{5.25 \text{ feet}}{1} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{2.54 \text{ cm}}{1 \text{ in}} = 160.02 \text{ cm}$$

10. 160.02 cm

11. Convert 5.50 yds to meters

$$\frac{5.50 \text{ yd}}{1} \times \frac{36 \text{ in}}{1 \text{ yd}} \times \frac{2.54 \text{ cm}}{1 \text{ in}} \times \frac{1 \text{ meter}}{100 \text{ cm}} =$$

11. 5.0292 m

12. Convert 126 cm to inches.

$$\frac{126 \text{ cm}}{1} \times \frac{1 \text{ in}}{2.54 \text{ cm}} = 49.60629921 \text{ in}$$

$$= 49.6 \text{ in}$$

12. 49.6 in

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Final Exam Review – Day 1-3

13. Perform the indicated operations: $(-2x^2y^3)^3$

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

$$= -8x^6y^9$$

13. $-8x^6y^9$

14. Perform the indicated operations: $(-\frac{2}{3}a^2b^2c)^2(3ab^3)^2$

$$= (-\frac{2}{3}a^2b^2c)(-\frac{2}{3}a^2b^2c)(3ab^3)(3ab^3)$$

$$= +4a^4b^4c^2$$

14. $+4a^4b^4c^2$

15. Perform the indicated operations: $\frac{(6x^3y^5z)^2}{(3xy)^2}$

$$= \frac{36x^6y^{10}z^2}{9x^2y^2} = 4x^4y^8z^2$$

15. $4x^4y^8z^2$

16. Simplify: Write the final form with positive exponents only: $\frac{2^{-3}x^3y^4}{4x^{-2}y}$

$$= \frac{x^3x^2y^4}{2^3 \cdot 4 \cdot y} = \frac{x^5y^3}{32}$$

16. $\frac{x^5y^3}{32}$

17. Simplify: Write the final form with positive exponents only: $\frac{5^2x^{-2}y^0z^6}{x^{-4}y^{-1}z^3}$

$$= \frac{25x^4y^0z^6}{x^2y^1z^3} = 25x^2yz^3$$

17. $25x^2yz^3$

18. Simplify: Write the final form with positive exponents only: $\frac{10^{-2}xy^{-2}z^{-6}}{5^{-2}x^3z^{-4}}$

$$= \frac{25x^4y^2z^6}{100x^3y^2z^6} = \frac{x}{4x^3y^2z^2}$$

18. $\frac{x}{4x^3y^2z^2}$

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Final Exam Review – Day 1-4

19. Perform the indicated operations: express your answer in scientific notation. $\frac{(2.20 \times 10^7)}{(8.82 \times 10^{-7})}$
- $= ,2444331066 \times 10^{14}$
 $= 2.49 \times 10^{13}$
19. 2.49 x 10¹³
-
20. Perform the indicated operations: express your answer in scientific notation. $\frac{(2.20 \times 10^7)(3.12 \times 10^{-12})}{(2.25 \times 10^{-5})}$
- $= \frac{6.864 \times 10^{-5}}{2.25 \times 10^{-5}} = 3.050666667 \times 10^0$
 $= 3.05$
20. 3.05
-
21. Perform the indicated operations: express your answer in scientific notation. $(1.25 \times 10^{12})(9.98 \times 10^4)$
- $= 12.475 \times 10^{16}$
 $= 1.2475 \times 10^{17}$
 $= 1.25 \times 10^{17}$
- 1.25 x 10¹⁷
-
22. Simplify the Radical Expression: $\sqrt{200x^6y^{11}}$
- $= \sqrt{100} \cdot \sqrt{2} \sqrt{x^6} \sqrt{y^{10}} \sqrt{y}$
 $= 10x^3y^5 \sqrt{2y}$
22. 10 x³ y⁵ √2y
-
23. Simplify the Radical Expression: $\sqrt{50a^3b^{11}c^{20}}$
- $= \sqrt{25} \sqrt{2} \sqrt{a^2} \sqrt{a} \sqrt{b^{10}} \sqrt{b} \sqrt{c^{20}}$
 $= 5ab^5c^{10} \sqrt{2ab}$
23. 5ab⁵c¹⁰ √2ab
-
24. Simplify the Cubed Root: $\sqrt[3]{54x^9y^4z^{11}}$
- $= \sqrt[3]{27} \sqrt[3]{2} \sqrt[3]{x^9} \sqrt[3]{y^3} \sqrt[3]{y} \sqrt[3]{z^9} \sqrt[3]{z^2}$
 $= 3x^3y^3z^3 \sqrt[3]{2yz^2}$
24. 3x³y³z³ √[3]{2yz²}

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Final Exam Review – Day 1-5

25. Simplify the Polynomial Expression: $3x - (5y - (3x - y))$
 $= 3x - (5y - 3x + y)$
 $= 3x - (6y - 3x)$
 $= 3x - 6y + 3x \rightarrow 6x - 6y$ 25. 6x - 6y

26. Simplify the Polynomial Expression: $4 - x - (3 + (7 - 2x))$
 $= 4 - x - (3 + 7 - 2x)$
 $= 4 - x - (10 - 2x)$
 $= 4 - x - 10 + 2x \rightarrow -6 + x$ 26. -6 + x or x - 6

27. Simplify the Polynomial Expression: $-(xy - 3) - (yx + (4 - 3xy))$
 $= -xy + 3 - (yx + 4 - 3xy)$
 $= -xy + 3 - (2xy + 4)$
 $= -xy + 3 + 2xy - 4 \rightarrow xy - 1$ 27. xy - 1

28. Perform the indicated operations, combine any like terms: $(5 + 2x)(1 - 3x)$
F O I L
5 -15x + 2x -6x²
5 - 13x - 6x² 28. 5 - 13x - 6x²

29. Perform the indicated operations, combine any like terms: $(3y - 5)(2y + 3) - y(y + 2)$
i. F O I L
6y² + 9y - 10y - 15
6y² - y - 15
= 6y² - y - 15
6y² - y - 15 - y² - 2y
= 5y² - 3y - 15 29. 5y² - 3y - 15

30. Perform the indicated operations, combine any like terms: $(x^2 - 2x + 3)(x^2 + 4x + 3)$
- See Attached 30. _____

30a. Divide: $\frac{5a^3b - 10a^2b + 15ab}{5ab}$
- See Attached 30a. _____

30b. Divide: $(6c^3 - 8c^2 - 17c - 6) \div (3c + 2)$
- See Attached 30b. _____

Review Dec 1-5

#30

$$\begin{array}{r}
 x^2 - 2x + 3 \\
 \hline
 x^2 + 4x + 3 \\
 \hline
 x^4 - 2x^3 + 3x^2 \\
 \quad + 4x^3 - 8x^2 + 12x \\
 \quad \quad + 3x^2 - 6x + 9 \\
 \hline
 = x^4 + 2x^3 - 2x^2 + 6x + 9
 \end{array}$$

#30a. "Break Up" the Numerator

$$= \frac{5a^3b}{5ab} - \frac{10a^2b}{5ab} + \frac{15ab}{5ab}$$

$$= a^2 - 2a + 3$$

#30b.

$$\begin{array}{r}
 3c+2 \overline{) 2c^2 - 4c - 3} \\
 \underline{6c^3 - 8c^2 - 17c - 6} \\
 6c^3 + 4c^2 \\
 \hline
 = -12c^2 - 17c \\
 \underline{-12c^2 - 8c} \\
 -9c - 6 \\
 \underline{-9c - 6} \\
 0
 \end{array}$$

$$= 2c^2 - 4c - 3$$

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Final Exam Review – Day 1-6

31. Factor Completely: $5x^2 - 125 = 5(x^2 - 25)$ 31. _____
 $= 5(x+5)(x-5)$

32. Factor Completely: $3x^2 - 2x - 5 = 3x^2 + 3x - 5x - 5$ 32. _____
 $= 3x(x+1) - 5(x+1)$
 $= (x+1)(3x-5)$

33. Factor Completely: $12x^2 + 13x - 4 = 12x^2 + 16x - 3x - 4$ 33. _____
 $= 4x(3x+4) - 1(3x+4)$
 $= (3x+4)(4x-1)$

34. Factor Completely: $x^4 - 13x^2 + 36 = (x^2 - 9)(x^2 - 4)$ 34. _____
 $= (x+3)(x-3)(x+2)(x-2)$

35. Factor Completely: $x^4 - 5x^2 + 4 = (x^2 - 4)(x^2 - 1)$ 35. _____
 $= (x+2)(x-2)(x+1)(x-1)$

36. Factor Completely: $4ax^2 - 36ay^2 = 4a(x^2 - 9y^2)$ 36. _____
 $= 4a(x+3y)(x-3y)$

37. Find the roots (solutions) for the following equation: $x^2 + 5x - 6 = 0$ 37. _____
See Attached

38. Find the roots (solutions) for the following equation: $2x^2 + 5x - 7 = 0$ 38. _____
See Attached

39. Find the roots (solutions) for the following equation: $x^2 - 7x = 0$ 39. _____
See Attached

Review Day 1-6

37.

$$x^2 + 5x - 6 = 0$$

$$\frac{(x+6)(x-1)}{\quad} = 0$$

$x+6=0$	$x-1=0$
$-6-6$	$+1+1$
$x=-6$	$x=+1$

At $x = -6$

$$(-6)^2 + 5(-6) - 6 = 0$$

$$+36 - 30 - 6 = 0$$

$$0 = 0 \checkmark$$

At $x = +1$

$$(1)^2 + 5(1) - 6 = 0$$

$$+1 + 5 - 6 = 0$$

$$0 = 0 \checkmark$$

38.

$$2x^2 + 5x - 7 = 0$$

$$2x^2 + \underline{7}x - \underline{2}x - 7 = 0$$

$$x(2x+7) - 1(2x+7) = 0$$

$$\frac{(2x+7)(x-1)}{\quad} = 0$$

$2x+7=0$	$x-1=0$
$-7-7$	$+1+1$
$2x=-7$	$x=+1$
$x = -\frac{7}{2}$	

At $x = +1$

$$2(1)^2 + 5(1) - 7 = 0$$

$$2(1) + 5 - 7 = 0$$

$$2 + 5 - 7 = 0$$

$$0 = 0$$

At $x = -\frac{7}{2}$

$$2\left(-\frac{7}{2}\right)^2 + 5\left(-\frac{7}{2}\right) - 7 = 0$$

$$2\left(+\frac{49}{2}\right) - \frac{35}{2} - 7 = 0$$

$$\frac{49}{2} - \frac{35}{2} - \frac{14}{2} = 0$$

$$0 = 0 \checkmark$$

39.

$$x^2 - 7x = 0$$

$$\frac{x(x-7)}{\quad} = 0$$

$x=0$	$x-7=0$
	$+7+7$
	$x=+7$

At $x = 0$

$$(0)^2 - 7(0) = 0$$

$$0 - 0 = 0$$

$$0 = 0 \checkmark$$

At $x = 7$

$$(7)^2 - 7(7) = 0$$

$$49 - 49 = 0$$

$$0 = 0 \checkmark$$

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Final Exam Review – Day 1-7

40. Convert $32^{\circ} 14' 15''$ to degrees only (retain 4 significant digits)

- Calculator Application: $= 32.2375^{\circ}$
 $= 32.24^{\circ}$

40. _____

41. Convert $121^{\circ} 8' 45''$ to degrees only (retain 4 significant digits)

- Calculator Application: $= 121.1458333$
 $= 121.1^{\circ}$

41. _____

42. Write to the nearest second 71.325°

- Calculator Application: $= 71.19' 30''$

42. _____

43. Perform the Indicated Operation:

$$\frac{5}{x+3} + \frac{4}{x}$$

43. _____

- See Attached

44. Perform the Indicated Operation:

$$\frac{4}{t-2} - \frac{t-2}{t+1}$$

44. _____

- See Attached

45. Perform the Indicated Operation:

$$\frac{6-5x}{6x^2-9x} - \frac{x-2}{3x}$$

45. _____

- See Attached

Review Day 1-7

$$43. \frac{x(5)}{x(x+3)} + \frac{(4)(x+3)}{(x)(x+3)}$$

$$= \frac{5x + 4x + 12}{x(x+3)}$$

$$= \frac{9x + 12}{x(x+3)} \quad \text{Reduce!} \quad \frac{3(3x+4)}{x(x+3)}$$

Does Not Reduce...
Both Answers Are
Acceptable.

← Negative FOIL

$$44. \frac{(t+1)(4)}{(t+1)(t-2)} - \frac{(t-2)(t-2)}{(t+1)(t-2)}$$

$$\frac{4t + 4 - t^2 + 4t - 4}{(t+1)(t-2)}$$

$$= \frac{-t^2 + 8t}{(t+1)(t-2)}$$

OTTS

$$(t-2)(t-2)$$

$$= t^2 - 2t - 2t + 4$$

$$= t^2 - 4t + 4$$

← Negative FOIL

$$45. \frac{(6-5x)}{3x^2-9x} - \frac{(x-2)(x-3)}{3x(x-3)}$$

$$\Rightarrow \frac{6-5x}{3x(x-3)}$$

OTTS

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

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

$$x^2 - 5x + 6$$

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

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