

Technical Mathematics I

Homework Problems

Instructions

- Each assignment is to be done on regular-sized notebook paper.
- Your name and the assignment number should appear at the top of the first sheet.
- Please do not use a red pen or red pencil to do the homework.
- All relevant work is **required**. Failure to show relevant work will result in a large point deduction.

Graded Homework 1

1. Write 67,000,000 in scientific notation form.
2. Write 0.00000000932 in scientific notation form.
3. Write 6,032,000,000,000,000 in scientific notation form.
4. Write 4,325,000,000,000,000 in scientific notation form.
5. Write 0.00000000000003776 in scientific notation form.
6. Write 0.00237564 in scientific notation form.
7. Write 9.889×10^{16} in decimal form.
8. Write 1.2234×10^{-10} in decimal form.
9. Write 5.44671×10^3 in decimal form.
10. Write 3.07×10^{-7} in decimal form.
11. Write 4.25×10^{10} in decimal form.
12. Write 6.735×10^{-12} in decimal form.

Graded Homework 2

1. Simplify the following expression.
 $(4x^2 - 2x + 7) - (-x^2 - 5x + 6)$
2. Simplify the following expression.
 $(x^2 - 3x) - (2x - x^2) + (7x^2 - 5)$
3. Simplify the following expression.
 $(x^2 - 3x + 9) - (-3x^2 - 3x + 4)$
4. Simplify the following expression.
 $(x^3 - 3) + (4 - 3x^2) - (x^2 - 5x^3)$
5. Simplify the following expression.
 $-(x - 4) + (2x - 1) - (3x + 9) + (8x + 5)$
6. Simplify the following expression.
 $[x - (2y - (4x - 2y))] - [y + (3x - 4y)]$
7. Simplify the following expression.
 $-[x^2 - (5x^2 - 2x)] - [3 - (4x + 9x^2)]$
8. Simplify the following expression.
 $-(3x + 9) - (4x - 2) + (-2x - 8) - (x - 1)$

9. Simplify the following expression.
 $[x - (3y + 7x)] - [2y + (3x - (y + 5x))]$
10. Simplify the following expression.
 $-[1 - (x^2 + 2x)] - [4x + 3 - (x^2 + 2)]$

Graded Homework 3

1. Simplify the following expression.
 $3x^5 \cdot 7x^4$
2. Simplify the following expression.
 $4x^6 \cdot 9x^{12}$
3. Simplify the following expression.
 $\frac{9x^7}{6x^8}$
4. Simplify the following expression.
 $\frac{68x^{11}}{51x^{19}}$
5. Simplify the following expression.
 $(-4x^5y)^3$
6. Simplify the following expression.
 $(-5x^{10}y^4z)^4$
7. Simplify the following expression.
 $\left(\frac{-3x^5}{6y^3}\right)^4$
8. Simplify the following expression.
 $\left(\frac{26x^9}{52y^7}\right)^5$
9. Simplify the following expression.
 $(-5xy^3z^4)^3$
10. Simplify the following expression.
 $\frac{(-9x^4z)^2}{-81x^4yz^2}$

11. Simplify the following expression.

$$\frac{-4^2 x^6 y}{(-2xy)^4}$$

12. Simplify the following expression.

$$\left(-9(2x^2)^3 x^4\right)^2$$

13. Simplify the following radical.

$$\sqrt{169}$$

14. Simplify the following radical.

$$\sqrt{125}$$

15. Simplify the following radical.

$$\sqrt{98}$$

16. Simplify the following radical.

$$\sqrt{315}$$

17. Simplify the following radical.

$$\sqrt{192}$$

18. Simplify the following radical.

$$\sqrt{288}$$

19. Simplify the following radical.

$$\sqrt[3]{-135}$$

20. Simplify the following radical.

$$\sqrt[4]{32}$$

Graded Homework 4

1. Perform the indicated product.

$$2x(x - 4)$$

2. Perform the indicated product.

$$-3x^2(x^2 - 8)$$

3. Perform the indicated product.

$$10x(x^3 - 5x - 7)$$

4. Perform the indicated product.

$$(x - 6)(x + 9)$$

5. Perform the indicated product.

$$(x - 3)(x + 12)$$

6. Perform the indicated product.

$$(4x - 5)(x^2 - 9x)$$

7. Perform the indicated product.

$$(3x^2 - 2)(x^3 - 9x)$$

8. Perform the indicated product.

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

9. Perform the indicated product.

$$(x + 2)(x^2 + 4x - 3)$$

10. Perform the indicated product.

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

11. Perform the indicated product.

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

12. Perform the indicated product.

$$(x^2 - 2x - 3)(4x^2 - x + 4)$$

13. Perform the indicated product.

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

14. Perform the indicated product.

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

15. Perform the indicated product.

$$(x + 1)^3$$

16. Perform the indicated product.

$$(x - 2)^4$$

Graded Homework 5

1. Perform the indicated division.

$$\frac{9x^4 - 6x^3 + 12x^2}{-3x}$$

2. Perform the indicated division.

$$\frac{-48x^5 + 24x^3 - 6x^2}{-6x^2}$$

3. Perform the indicated division.

$$\frac{x^3 - 4x^2 + 7}{x - 3}$$

4. Perform the indicated division.

$$\frac{3x^4 - 2x^2 + 18}{x - 5}$$

5. Perform the indicated division.

$$\frac{2x^3 - 11x^2 + 11x + 5}{2x - 1}$$

6. Perform the indicated division.

$$\frac{12x^3 - 32x^2 + 43x - 7}{3x - 2}$$

7. Perform the indicated division.

$$\frac{x^4 - 3x + 4}{x^2 - 2x + 5}$$

8. Perform the indicated division.

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

Graded Homework 6

Solve each of the following equations for x .

1. $x + 9 = 4$
2. $x - 14 = 22$
3. $-8x = 19$
4. $-9x = 42$
5. $3x - 5 = -14$
6. $-7x + 29 = -53$
7. $9x + 8 = 4 - 11x$

8. $-12x + 5 = 13 - 2x$

9. $-2(3x - 4) = -2x - 8$

10. $6(10x - 9) = -30x + 63$

11. $4(x - 2) - (2x - 6) = 3(x - 5)$

12. $9(x - 2) = 3(x - 1) - (-4x - 5)$

13. $\frac{1}{2}x - 4 = 3 - \frac{2}{3}x$

14. $\frac{3}{4}x + 9 = 8 - \frac{3}{8}x$

15. $\frac{3}{5}x + \frac{5}{2} = 3\left(\frac{1}{6}x - \frac{4}{15}\right)$

16. $\frac{7}{2}x - \frac{4}{3} = 6\left(\frac{x}{18} - \frac{5}{12}\right)$

17. $\frac{7(x - 2)}{8} + \frac{1}{4} = \frac{x}{2} - 3$

18. $\frac{5}{12} - \frac{3(x + 1)}{4} = \frac{x}{6} + 1$

19. $-(x - (x - (x - 1))) = -(-x - (x - 2))$

20. $-(1 - x - (x + 2)) = -x - (2x - (x + 1))$

Graded Homework 7

1. Solve $V = IR$ for I .

2. Solve $E = \frac{hc}{\lambda}$ for λ .

3. Solve $PV = nRT$ for T .

4. Solve $\frac{P_1}{V_1} = \frac{P_2}{V_2}$ for V_1 .

5. Solve $I = \frac{V}{r + R}$ for R .

6. Solve $\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2}$ for C_1 .

Graded Homework 8

1. If $C = 2\pi r$ and $C = 13''$, find r .

2. If $\frac{a_1}{b_1} = \frac{a_2}{b_2}$, $a_1 = 6.0''$, $b_1 = 3.1''$, and $a_2 = 4.5''$, find b_2 .
3. If $\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2}$, $C = 1.7 \mu F$ (microfarads), and $C_2 = 2.3 \mu F$, find C_1 .
4. If $f' = f_0 \left(\frac{v}{v - v_s} \right)$, $f' = 1340 \text{ hz}$ (hertz), $v = 330 \text{ m/s}$, and $v_s = 22 \text{ m/s}$ find f_0 .
4. If $f(x) = 3x - 4$, then find each of the following. Function notation must be used correctly.

A. $f(-2t)$

B. $f(y)$

C. $f(n^2)$

D. $f(-x)$

5. If $s(t) = -t^2 + 2t$, then find each of the following. Function notation must be used correctly.

A. $s(t + 1)$

B. $s(t - 2)$

C. $s(2t - 3)$

D. $s(4 - t)$

6. What is the domain of the following function?

$$f(x) = \frac{2x + 6}{3x - 15}$$

7. What is the domain of the following function?

$$g(x) = \sqrt{4 - x}$$

Graded Homework 9

1. If $f(x) = x^2 - 3x + 5$, then find each of the following. Function notation must be used correctly.

A. $f(0)$

B. $f(-1)$

C. $f(3)$

D. $f(-2)$

2. If $g(x) = -2x - 7$, then find each of the following. Function notation must be used correctly.

A. $g(0)$

B. $g(2)$

C. $g(-1)$

D. $g(-3)$

3. If $h(t) = \frac{2t}{3 - t}$, then find each of the following. Function notation must be used correctly.

A. $h(0)$

B. $h(-4)$

C. $h(2)$

D. $h(-1)$

Graded Homework 10

1. Draw the graph of $y = 4 - 3x$. Find at least 7 points on the graph before drawing it.

2. Find at least four points on the graph of $y = 3x + 3$ and find at least four points on the graph of $y = -x - 5$. Sketch each graph. What point is on both graphs?

3. Draw the graph of $y = x^2 - 5$. Find at least 7 points on the graph before drawing it.

4. Draw the graph of $y = \sqrt{3 - x}$. Find at least 5 points on the graph before drawing it.

Graded Homework 11

1. Factor $3x^2 - 24x$.

- Factor $21x^2 - 14xy + 7xz$.
- Factor $49 - x^2$.
- Factor $25x^2 - 121y^2$.
- Factor $12y^2 - 75x^2$.
- Factor $x^4 - 1$.
- Factor $x^2 - 10x - 24$.
- Factor $x^2 - 13x + 12$.
- Factor $3x^2 + 18x + 24$.
- Factor $2x^2 + x - 28$.
- Factor $12x^2 - 31x + 20$.
- Factor $15x^2 + 23x + 8$.

Graded Homework 12

- Reduce $\frac{24x^3y^4z^2}{36xy^7z^2}$.
- Reduce $\frac{4(x-1)^2(x+2)}{8(x-1)^3(x+2)^5}$.
- Reduce $\frac{14x-28}{7x^2-28}$.
- Reduce $\frac{x^2-9}{3-x}$.
- Reduce $\frac{x^2-7x+12}{x^2-2x-8}$.
- Reduce $\frac{2x^3-x^2-15x}{8x^4+18x^3-5x^2}$.

Graded Homework 13

- Simplify the following product.

$$\frac{3x^2y^4}{5z^3} \cdot \frac{25z^9}{12x^5y^4}$$

- Simplify the following product.

$$(x^2 + 4x - 5) \cdot \frac{x^2 - 1}{x^2 - 2x + 1}$$

- Simplify the following product.

$$\frac{9 - 4x^2}{6x^2 + 19x + 15} \cdot \frac{18x^2 + 9x - 35}{2x^2 - 19x + 24}$$

- Simplify the following division.

$$(x^2 - 4) \div \frac{x + 2}{x - 2}$$

- Simplify the following division.

$$\frac{5x^3 - 10x^2 - 40x}{2x^2 - 7x - 4} \div \frac{10x^3 + 20x^2}{2x^2 - x - 1}$$

Graded Homework 14

- Simplify the following expression.

$$\frac{2}{3x^2} - \frac{1}{6x} + \frac{5}{2}$$

- Simplify the following expression.

$$\frac{3}{x-4} - 1$$

- Simplify the following expression.

$$\frac{3x-3}{x^2-9} - \frac{2}{x+3}$$

- Simplify the following expression.

$$\frac{1}{x^2-6x+5} + \frac{1}{x^2+2x-3}$$

- Simplify the following expression.

$$\frac{x^2-2x+2}{2x^2+3x-20} + \frac{x-3}{2x-5} - \frac{x+1}{x+4}$$

Graded Homework 15

- If possible, solve the following equation for x .

$$\frac{x-1}{3} + \frac{x+4}{4} = 2$$

- If possible, solve the following equation for x .

$$-3 = \frac{4x-8}{x-2}$$

3. If possible, solve the following equation for x .

$$\frac{5}{x+3} = -\frac{2}{x-1}$$

4. If possible, solve the following equation for x .

$$\frac{x-1}{x+2} - \frac{x-2}{x+1} = \frac{4x-1}{x^2+3x+2}$$

Graded Homework 16

1. Find the solution to the following system of equations.

$$\begin{aligned} 3x + 5y &= 3 \\ 5x - 2y &= 5 \end{aligned}$$

2. Find the solution to the following system of equations.

$$\begin{aligned} y &= 3x - 2 \\ x + 2y &= 10 \end{aligned}$$

3. Find the solution to the following system of equations.

$$\begin{aligned} 5x - 9y &= 2 \\ x + 3y &= -1 \end{aligned}$$

4. Find the solution to the following system of equations.

$$\begin{aligned} -4x + 10y &= -13 \\ 6x + 14y &= 9 \end{aligned}$$

Graded Homework 17

Solve each equation for x using the factoring method.

1. $x^2 - 13x = 0$
2. $3x^3 = 48x$
3. $x^2 + x = 2$
4. $6x^2 + 7x = 20$
5. $54x^2 = 39x + 8$

Graded Homework 18

Solve each equation for x using the quadratic formula.

1. $x^2 + 3x + 1 = 0$

2. $2x^2 = 3x + 3$

3. $x^2 = 2x + 4$

4. $4x^2 + 1 = 12x$

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

Homework Problems Solutions

Graded Homework 2

1. $5x^2 + 3x + 1$
2. $9x^2 - 5x - 5$
3. $4x^2 + 5$
4. $6x^3 - 4x^2 + 1$
5. $6x - 1$
6. $2x - y$
7. $13x^2 + 2x - 3$
8. $-10x - 14$
9. $-4x - 4y$
10. $2x^2 - 2x - 2$

Graded Homework 3

1. $21x^9$
2. $36x^{18}$
3. $\frac{3}{2x}$
4. $\frac{4}{3x^8}$
5. $-64x^{15}y^3$
6. $625x^{40}y^{16}z^4$
7. $\frac{x^{20}}{16y^{12}}$
8. $\frac{x^{45}}{32y^{35}}$
9. $-125x^3y^9z^{12}$
10. $-\frac{x^4}{y}$
11. $-\frac{x^2}{y^3}$
12. $5184x^{20}$
13. 13

14. $5\sqrt{5}$

15. $7\sqrt{2}$

16. $3\sqrt{35}$

17. $8\sqrt{3}$

18. $12\sqrt{2}$

19. $-3\sqrt[3]{5}$

20. $2\sqrt[4]{2}$

Graded Homework 4

1. $2x^2 - 8x$
2. $-3x^4 + 24x^2$
3. $10x^4 - 50x^2 - 70x$
4. $x^2 + 3x - 54$
5. $x^2 + 9x - 36$
6. $4x^3 - 41x^2 + 45x$
7. $3x^5 - 29x^3 + 18x$
8. $x^4 - 4x^2 + 4$
9. $x^3 + 6x^2 + 5x - 6$
10. $6x^4 + 7x^3 - 5x^2 - 8x + 4$
11. $x^4 - 6x^3 + 5x^2 + 13x - 4$
12. $4x^4 - 9x^3 - 6x^2 - 5x - 12$
13. $x^8 - x^4 - 2x^2 - 1$
14. $x^3 - 6x^2 + 11x - 6$
15. $x^3 + 3x^2 + 3x + 1$
16. $x^4 - 8x^3 + 24x^2 - 32x + 16$

Graded Homework 5

1. $-3x^3 + 2x^2 - 4x$
2. $8x^3 - 4x + 1$
3. $x^2 - x - 3 + \frac{-2}{x-3}$

$$4. 3x^3 + 15x^2 + 73x + 365 + \frac{1843}{x-5}$$

$$5. x^2 - 5x + 3 + \frac{8}{2x-1}$$

$$6. 4x^2 - 8x + 9 + \frac{11}{3x-2}$$

$$7. x^2 + 2x - 1 + \frac{-15x+9}{x^2-2x+5}$$

$$8. x - 3 + \frac{13x-11}{x^2+3x-2}$$

Graded Homework 6

$$1. x = -5$$

$$2. x = 36$$

$$3. x = -\frac{19}{8}$$

$$4. x = -\frac{14}{3}$$

$$5. x = -3$$

$$6. x = \frac{82}{7}$$

$$7. x = -\frac{1}{5}$$

$$8. x = -\frac{4}{5}$$

$$9. x = 4$$

$$10. x = \frac{13}{10}$$

$$11. x = 13$$

$$12. x = 10$$

$$13. x = 6$$

$$14. x = -\frac{8}{9}$$

$$15. x = -33$$

$$16. x = -\frac{7}{19}$$

$$17. x = -4$$

$$18. x = -\frac{16}{11}$$

$$19. x = 1$$

$$20. x = 0$$

Graded Homework 9

$$1. \text{ A. } f(0) = 5$$

$$\text{ B. } f(-1) = 9$$

$$\text{ C. } f(3) = 5$$

$$\text{ D. } f(-2) = 15$$

$$2. \text{ A. } g(0) = -7$$

$$\text{ B. } g(2) = -11$$

$$\text{ C. } g(-1) = -5$$

$$\text{ D. } g(-3) = -1$$

$$3. \text{ A. } h(0) = 0$$

$$\text{ B. } h(-4) = -\frac{8}{7}$$

$$\text{ C. } h(2) = 4$$

$$\text{ D. } h(-1) = -\frac{1}{2}$$

$$4. \text{ A. } f(-2t) = -6t - 4$$

$$\text{ B. } f(y) = 3y - 4$$

$$\text{ C. } f(n^2) = 3n^2 - 4$$

$$\text{ D. } f(-x) = -3x - 4$$

$$5. \text{ A. } s(t+1) = -t^2 + 1$$

$$\text{ B. } s(t-2) = -t^2 + 6t - 8$$

$$\text{ C. } s(2t-3) = -4t^2 + 16t - 15$$

$$\text{ D. } s(4-t) = -t^2 + 6t - 8$$

$$6. x \neq 5$$

$$7. x \leq 4$$

Graded Homework 12

1. $\frac{2x^2}{3y^3}$
2. $\frac{1}{2(x-1)(x+2)^4}$
3. $\frac{2}{x+2}$
4. $-x-3$
5. $\frac{x-3}{x+2}$
6. $\frac{x-3}{x(4x-1)}$

Graded Homework 13

1. $\frac{5z^6}{4x^3}$
2. $(x+1)(x+5)$
3. $-\frac{6x-7}{x-8}$
4. $(x-2)^2$
5. $\frac{x-1}{2x}$

Graded Homework 14

1. $\frac{15x^2-x+4}{6x^2}$
2. $\frac{7-x}{x-4}$
3. $\frac{1}{x-3}$
4. $\frac{2}{(x-5)(x+3)}$
5. $\frac{1}{x+4}$

Graded Homework 15

1. $x = \frac{16}{7}$
2. No solutions
3. $x = -\frac{1}{7}$
4. $x = 1$

Graded Homework 16

1. $x = 1, y = 0$
2. $x = 2, y = 4$
3. $x = -\frac{1}{8}, y = -\frac{7}{24}$
4. $x = \frac{68}{29}, y = -\frac{21}{58}$

Graded Homework 17

1. $x = 0$ or $x = 13$
2. $x = 0$ or $x = \pm 4$
3. $x = 1$ or $x = -2$
4. $x = \frac{4}{3}$ or $x = -\frac{5}{2}$
5. $x = \frac{8}{9}$ or $x = -\frac{1}{6}$

Graded Homework 18

1. $x = \frac{-3 \pm \sqrt{5}}{2}$
2. $x = \frac{3 \pm \sqrt{33}}{4}$
3. $x = 1 \pm \sqrt{5}$
4. $x = \frac{3 \pm 2\sqrt{2}}{2}$
5. No real solutions