MATH140: Integration and Antiderivatives

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Name: _____ Date: _____ Score: / 30

Learning Objectives

- Calculate the mean, median, mode, and range of a data set
- Compute sample variance and standard deviation
- Construct quartiles, the IQR, and identify outliers
- Describe the shape, center, and spread of a distribution

Simplify each expression completely. Show all steps and circle your final answer.

Antiderivatives — power rule

1. Find the antiderivative: integral of 2x^1 dx.

$$\int 2x^{1}\,dx$$

Answer: _____

2. Marginal cost is MC(x) = 2x^2. Find the total cost function TC(x) = integral of MC dx.

$$\int 2x^{2}\,dx$$

Answer: _____

3. Find the antiderivative: integral of 2x^4 dx.

$$\int 2x^{4}\,dx$$

Answer: _____

4. Marginal cost is MC(x) = 7x^1. Find the total cost function TC(x) = integral of MC dx.

$$\int 7x^{1}\,dx$$

Answer: _____

5. Find the antiderivative: integral of 8x^3 dx.

$$\int 8x^{3}\,dx$$

Answer: _____

6. Marginal cost is MC(x) = 5x^3. Find the total cost function TC(x) = integral of MC dx.

$$\int 5x^3\,dx$$

Answer: _____

7. Find the antiderivative: integral of 3x^4 dx.

$$\int 3x^4\,dx$$

Answer: _____

8. Marginal cost is MC(x) = 3x^1. Find the total cost function TC(x) = integral of MC dx.

$$\int 3x^1\,dx$$

Answer: _____

9. Find the antiderivative: integral of 4x^2 dx.

$$\int 4x^2\,dx$$

Answer: _____

10. Marginal cost is MC(x) = 5x^1. Find the total cost function TC(x) = integral of MC dx.

$$\int 5x^1\,dx$$

Answer: _____

11. Find the antiderivative: integral of 3x^1 dx.

$$\int 3x^1\,dx$$

Answer: _____

12. Marginal cost is MC(x) = 9x^2. Find the total cost function TC(x) = integral of MC dx.

$$\int 9x^2\,dx$$

Answer: _____

13. Find the antiderivative: integral of 2x^3 dx.

$$\int 2x^3\,dx$$

Answer: _____

14. Marginal cost is MC(x) = 3x^1. Find the total cost function TC(x) = integral of MC dx.

$$\int 3x^1\,dx$$

Answer: _____

15. Find the antiderivative: integral of 2x^3 dx.

$$\int 2x^3\,dx$$

Answer: _____

16. Marginal cost is MC(x) = 7x^3. Find the total cost function TC(x) = integral of MC dx.

$$\int 7x^3\,dx$$

Answer: _____

Definite integrals

17. Evaluate the definite integral: integral from 2 to 2 of x^2 dx.

$$\int_2^2 x^2\,dx$$

Answer: _____

18. A marginal revenue function is MR(x) = x^2. Find total revenue from x = 1 to x = 6 units.

$$\int_1^6 x^2\,dx$$

Answer: _____

19. Evaluate the definite integral: integral from 1 to 3 of x^3 dx.

$$\int_1^3 x^3\,dx$$

Answer: _____

20. A marginal revenue function is MR(x) = x^1. Find total revenue from x = 1 to x = 6 units.

$$\int_1^6 x^1\,dx$$

Answer: _____

21. Evaluate the definite integral: integral from 0 to 5 of x^2 dx.

$$\int_0^5 x^2\,dx$$

Answer: _____

22. A marginal revenue function is MR(x) = x^1. Find total revenue from x = 1 to x = 6 units.

$$\int_1^6 x^1\,dx$$

Answer: _____

23. Evaluate the definite integral: integral from 0 to 5 of x^3 dx.

$$\int_0^5 x^3\,dx$$

Answer: _____

24. A marginal revenue function is MR(x) = x^1. Find total revenue from x = 1 to x = 3 units.

$$\int_1^3 x^1\,dx$$

Answer: _____

25. Evaluate the definite integral: integral from 1 to 3 of x^2 dx.

$$\int_1^3 x^2\,dx$$

Answer: _____

26. A marginal revenue function is MR(x) = x^2. Find total revenue from x = 0 to x = 4 units.

$$\int_0^4 x^2\,dx$$

Answer: _____

27. Evaluate the definite integral: integral from 0 to 5 of x^2 dx.

$$\int_0^5 x^2\,dx$$

Answer: _____

28. A marginal revenue function is MR(x) = x^2. Find total revenue from x = 1 to x = 5 units.

$$\int_1^5 x^2\,dx$$

Answer: _____

29. Evaluate the definite integral: integral from 1 to 2 of x^3 dx.

$$\int_1^2 x^3\,dx$$

Answer: _____

30. A marginal revenue function is MR(x) = x^1. Find total revenue from x = 0 to x = 4 units.

$$\int_0^4 x^1\,dx$$

Answer: _____

MATH140: Integration and Antiderivatives

ANSWER KEY & SOLUTIONS

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Topics: Antiderivatives — power rule, Definite integrals. All answers verified by independent computation.

Solutions

Antiderivatives — power rule

1. Find the antiderivative: integral of 2x^1 dx.

$$\int 2x^1\,dx$$

→ *Power rule for integration: (a/(n+1))x^(n+1) + C.*
→ *= 1x^2 + C.*

Answer: $\frac{2}{2}x^2 + C \Rightarrow \text{coeff} = 1$

2. Marginal cost is MC(x) = 2x^2. Find the total cost function TC(x) = integral of MC dx.

$$\int 2x^2\,dx$$

→ *TC(x) = integral of 2x^2 dx = 2/3x^3 + C.*
→ *The constant C represents the fixed cost.*

Answer: $\frac{2}{3}x^3 + C \Rightarrow \text{coeff} = 2/3$

3. Find the antiderivative: integral of 2x^4 dx.

$$\int 2x^4\,dx$$

→ *Power rule for integration: (a/(n+1))x^(n+1) + C.*
→ *= 2/5x^5 + C.*

Answer: $\frac{2}{5}x^5 + C \Rightarrow \text{coeff} = 2/5$

4. Marginal cost is MC(x) = 7x^1. Find the total cost function TC(x) = integral of MC dx.

$$\int 7x^1\,dx$$

→ *TC(x) = integral of 7x^1 dx = 7/2x^2 + C.*
→ *The constant C represents the fixed cost.*

Answer: $\frac{7}{2}x^2 + C \Rightarrow \text{coeff} = 7/2$

5. Find the antiderivative: integral of 8x^3 dx.

$$\int 8x^3\,dx$$

→ *Power rule for integration: (a/(n+1))x^(n+1) + C.*
→ *= 2x^4 + C.*

Answer: $\frac{8}{4}x^4 + C \Rightarrow \text{coeff} = 2$

6. Marginal cost is MC(x) = 5x^3. Find the total cost function TC(x) = integral of MC dx.

$$\int 5x^3\,dx$$

→ *TC(x) = integral of 5x^3 dx = 5/4x^4 + C.*
→ *The constant C represents the fixed cost.*

Answer: $\frac{5}{4}x^4 + C \Rightarrow \text{coeff} = 5/4$

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7. Find the antiderivative: integral of 3x^4 dx.

$$\int 3x^4\,dx$$

→ *Power rule for integration: (a/(n+1))x^(n+1) + C.*
→ *= 3/5x^5 + C.*

Answer: $\frac{3}{5}x^5 + C \Rightarrow \text{coeff} = 3/5$

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8. Marginal cost is MC(x) = 3x^1. Find the total cost function TC(x) = integral of MC dx.

$$\int 3x^1\,dx$$

→ *TC(x) = integral of 3x^1 dx = 3/2x^2 + C.*
→ *The constant C represents the fixed cost.*

Answer: $\frac{3}{2}x^2 + C \Rightarrow \text{coeff} = 3/2$

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9. Find the antiderivative: integral of 4x^2 dx.

$$\int 4x^2\,dx$$

→ *Power rule for integration: (a/(n+1))x^(n+1) + C.*
→ *= 4/3x^3 + C.*

Answer: $\frac{4}{3}x^3 + C \Rightarrow \text{coeff} = 4/3$

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10. Marginal cost is MC(x) = 5x^1. Find the total cost function TC(x) = integral of MC dx.

$$\int 5x^1\,dx$$

→ *TC(x) = integral of 5x^1 dx = 5/2x^2 + C.*
→ *The constant C represents the fixed cost.*

Answer: $\frac{5}{2}x^2 + C \Rightarrow \text{coeff} = 5/2$

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11. Find the antiderivative: integral of 3x^1 dx.

$$\int 3x^1\,dx$$

→ *Power rule for integration: (a/(n+1))x^(n+1) + C.*
→ *= 3/2x^2 + C.*

Answer: $\frac{3}{2}x^2 + C \Rightarrow \text{coeff} = 3/2$

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12. Marginal cost is MC(x) = 9x^2. Find the total cost function TC(x) = integral of MC dx.

$$\int 9x^2\,dx$$

→ *TC(x) = integral of 9x^2 dx = 3x^3 + C.*
→ *The constant C represents the fixed cost.*

Answer: $\frac{9}{3}x^3 + C \Rightarrow \text{coeff} = 3$

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13. Find the antiderivative: integral of 2x^3 dx.

$$\int 2x^3\,dx$$

→ *Power rule for integration: (a/(n+1))x^(n+1) + C.*
→ *= 1/2x^4 + C.*

Answer: $\frac{2}{4}x^4 + C \Rightarrow \text{coeff} = 1/2$

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14. Marginal cost is MC(x) = 3x^1. Find the total cost function TC(x) = integral of MC dx.

$$\int 3x^1\,dx$$

→ *TC(x) = integral of 3x^1 dx = 3/2x^2 + C.*
→ *The constant C represents the fixed cost.*

Answer: $\frac{3}{2}x^2 + C \Rightarrow \text{coeff} = 3/2$

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15. Find the antiderivative: integral of 2x^3 dx.

$$\int 2x^3\,dx$$

→ *Power rule for integration: (a/(n+1))x^(n+1) + C.*
→ *= 1/2x^4 + C.*

Answer: $\frac{2}{4}x^4 + C \Rightarrow \text{coeff} = 1/2$

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16. Marginal cost is MC(x) = 7x^3. Find the total cost function TC(x) = integral of MC dx.

$$\int 7x^3\,dx$$

→ *TC(x) = integral of 7x^3 dx = 7/4x^4 + C.*
→ *The constant C represents the fixed cost.*

Answer: $\frac{7}{4}x^4 + C \Rightarrow \text{coeff} = 7/4$

Definite integrals

17. Evaluate the definite integral: integral from 2 to 2 of x^2 dx.

$$\int_{2}^{2} x^2\,dx$$

→ = [x^{n+1}/({n+1})] from {lo} to {hi}.
→ = ({hi_pow} - {lo_pow}) / ({n+1}) = {answer_defint210}.

Answer: $\frac{8-8}{3} = 0$

18. A marginal revenue function is MR(x) = x^2. Find total revenue from x = 1 to x = 6 units.

$$\int_{1}^{6} x^2\,dx$$

→ TR = integral from {lo} to {hi} of x^{n} dx = [x^{n+1}/({n+1})] from {lo} to {hi}.
→ = ({hi_pow} - {lo_pow}) / ({n+1}) = {answer_defint210}.

Answer: $\frac{216-1}{3} = 215/3$

19. Evaluate the definite integral: integral from 1 to 3 of x^3 dx.

$$\int_{1}^{3} x^3\,dx$$

→ = [x^{n+1}/({n+1})] from {lo} to {hi}.
→ = ({hi_pow} - {lo_pow}) / ({n+1}) = {answer_defint210}.

Answer: $\frac{81-1}{4} = 20$

20. A marginal revenue function is MR(x) = x^1. Find total revenue from x = 1 to x = 6 units.

$$\int_{1}^{6} x^1\,dx$$

→ TR = integral from {lo} to {hi} of x^{n} dx = [x^{n+1}/({n+1})] from {lo} to {hi}.
→ = ({hi_pow} - {lo_pow}) / ({n+1}) = {answer_defint210}.

Answer: $\frac{36-1}{2} = 35/2$

21. Evaluate the definite integral: integral from 0 to 5 of x^2 dx.

$$\int_{0}^{5} x^2\,dx$$

→ = [x^{n+1}/({n+1})] from {lo} to {hi}.
→ = ({hi_pow} - {lo_pow}) / ({n+1}) = {answer_defint210}.

Answer: $\frac{125-0}{3} = 125/3$

22. A marginal revenue function is MR(x) = x^1. Find total revenue from x = 1 to x = 6 units.

$$\int_1^6 x^1\,dx$$

→ *TR = integral from {lo} to {hi} of x^{n} dx = [x^{n+1}/({n+1})] from {lo} to {hi}.*
→ *= ({hi_pow} - {lo_pow}) / ({n+1}) = {answer_defint210}.*

Answer: $\frac{36-1}{2} = 35/2$

23. Evaluate the definite integral: integral from 0 to 5 of x^3 dx.

$$\int_0^5 x^3\,dx$$

→ *= [x^{n+1}/({n+1})] from {lo} to {hi}.*
→ *= ({hi_pow} - {lo_pow}) / ({n+1}) = {answer_defint210}.*

Answer: $\frac{625-0}{4} = 625/4$

24. A marginal revenue function is MR(x) = x^1. Find total revenue from x = 1 to x = 3 units.

$$\int_1^3 x^1\,dx$$

→ *TR = integral from {lo} to {hi} of x^{n} dx = [x^{n+1}/({n+1})] from {lo} to {hi}.*
→ *= ({hi_pow} - {lo_pow}) / ({n+1}) = {answer_defint210}.*

Answer: $\frac{9-1}{2} = 4$

25. Evaluate the definite integral: integral from 1 to 3 of x^2 dx.

$$\int_1^3 x^2\,dx$$

→ *= [x^{n+1}/({n+1})] from {lo} to {hi}.*
→ *= ({hi_pow} - {lo_pow}) / ({n+1}) = {answer_defint210}.*

Answer: $\frac{27-1}{3} = 26/3$

26. A marginal revenue function is MR(x) = x^2. Find total revenue from x = 0 to x = 4 units.

$$\int_0^4 x^2\,dx$$

→ *TR = integral from {lo} to {hi} of x^{n} dx = [x^{n+1}/({n+1})] from {lo} to {hi}.*
→ *= ({hi_pow} - {lo_pow}) / ({n+1}) = {answer_defint210}.*

Answer: $\frac{64-0}{3} = 64/3$

27. Evaluate the definite integral: integral from 0 to 5 of x^2 dx.

$$\int_0^5 x^2\,dx$$

→ *= [x^{n+1}/({n+1})] from {lo} to {hi}.*
→ *= ({hi_pow} - {lo_pow}) / ({n+1}) = {answer_defint210}.*

Answer: $\frac{125-0}{3} = 125/3$

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28. A marginal revenue function is MR(x) = x^2. Find total revenue from x = 1 to x = 5 units.

$$\int_1^5 x^2\,dx$$

→ *TR = integral from {lo} to {hi} of x^{n} dx = [x^{n+1}/({n+1})] from {lo} to {hi}.*
→ *= ({hi_pow} - {lo_pow}) / ({n+1}) = {answer_defint210}.*

Answer: $\frac{125-1}{3} = 124/3$

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29. Evaluate the definite integral: integral from 1 to 2 of x^3 dx.

$$\int_1^2 x^3\,dx$$

→ *= [x^{n+1}/({n+1})] from {lo} to {hi}.*
→ *= ({hi_pow} - {lo_pow}) / ({n+1}) = {answer_defint210}.*

Answer: $\frac{16-1}{4} = 15/4$

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30. A marginal revenue function is MR(x) = x^1. Find total revenue from x = 0 to x = 4 units.

$$\int_0^4 x^1\,dx$$

→ *TR = integral from {lo} to {hi} of x^{n} dx = [x^{n+1}/({n+1})] from {lo} to {hi}.*
→ *= ({hi_pow} - {lo_pow}) / ({n+1}) = {answer_defint210}.*

Answer: $\frac{16-0}{2} = 8$
