

Chapter 5
Section 2

Growth & Decay Functions

Model for GROWTH

$$A(t) = A_0(1 + r)^t$$

A_0 = initial amount

Model for DECAY

$$A(t) = A_0(1 - r)^t$$

r = rate t = time

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Examples

1. Jeans at a department store increase at a rate of 8% per year. The current price of jeans is \$25. What will be the cost of jeans four years from now?

$$25(1 + .08)^4 = \boxed{\$34^{01}}$$

2. You bought a boat for \$9800 three years ago and have decided to upgrade to a newer boat. To make your new purchase you put down the money you make from the sale of the old boat. The bank informed you that boats decrease about 20% per year. How much money do you expect to get from your boat sale?

$$9800(1 - .2)^3 = \boxed{\$5017^{60}}$$

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3. A train ticket costs \$275 on average. The annual rate of increase is 18%. What will be the average rate in 10 years?

$$275(1+.18)^{10} = \boxed{\$1439 \frac{30}{100}}$$

4. Sam purchased a motorcycle for \$7500 eight years ago and now plans to sell it. The annual rate of decrease for a motorcycle is approximately 21% depending on the condition. How much should Sam sell his motorcycle for?

$$7500(1-.21)^8 = \boxed{\$1137 \frac{83}{100}}$$

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RATIONAL EXPONENTS

$$c^{\frac{m}{n}} = \sqrt[n]{c^m} = (\sqrt[n]{c})^m$$

Examples

1. $4^{\frac{1}{2}}$

$$(\sqrt[2]{4})^1 = (2)^1 = 2$$

$$\sqrt[2]{4} = 2$$

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

$$(\sqrt[2]{4})^{-3} = (2)^{-3} = \frac{1}{2^3} = \frac{1}{8}$$

$$\sqrt[2]{4^{-3}} = \sqrt{\frac{1}{4^3}} = \sqrt{\frac{1}{64}} = \frac{\sqrt{1}}{\sqrt{64}} = \frac{1}{8}$$

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3. $-9^{1/2} \neq \sqrt{-9}$
 $-1 \cdot 9^{1/2}$
 $-1 \cdot \sqrt{9} = -1 \cdot 3 = \boxed{-3}$

4. $(3^{1/2} \cdot 5^{1/2})^2 = (\sqrt{3} \cdot \sqrt{5})^2$
 $(3^{1/2})^2 \cdot (5^{1/2})^2 = (\sqrt{15})^2 = \boxed{15}$
 $3^1 \cdot 5^1 = \boxed{15}$

5. $(3^{1/2} + 5^{1/2})^2$
 $(\sqrt{3} + \sqrt{5})(\sqrt{3} + \sqrt{5})$
 $\underline{3} + \sqrt{15} + \sqrt{15} + \underline{5}$
 $\boxed{8 + 2\sqrt{15}}$

6. $\frac{x^{1/3}}{2x^{-2/3}} \quad \frac{1}{3} + \frac{2}{3} = \frac{3}{3} = 1$
 $\frac{x^1}{2} = \boxed{\frac{x}{2}}$

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Solve

1. $3^{2x} = 3^{12}$
 $2x = 12$
 $\boxed{x = 6}$ $3^{2 \cdot 6} = 3^{12}$

2. $9^x = 3^5$
 $(3^2)^x = 3^5$
 $3^{2x} = 3^5$
 $\frac{2x}{2} = \frac{5}{2}$
 $\boxed{x = 5/2}$

3. $(x^{2/3})^{3/2} = (9)^{3/2}$
 $x^1 = 9^{3/2}$
 $x = (\sqrt[2]{9})^3 = (3)^3 = \boxed{27}$

4. $(x^{-1/2})^2 = (4)^{-2}$
 $x^1 = 4^{-2}$
 $x = \frac{1}{4^2} = \boxed{\frac{1}{16}}$

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Homework

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#1ac, 3ac, 5ac, 7-15 odd, 29, 31

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