Panel 1

Chapter 3 - Review

Lines: slope, point-slope, slope-int, parallel, perpendicular

Applications: demand / supply

Quadratic functions: vertex, quadratic formula,

Systems of Equations: substitution or elimination
non-linear

Applications: equilibrium point, Revenue, Cost, fixed cost, variable cost, profit, break-even point

1

Panel 2

Find the equilibrium point if supply and demand are $p = \frac{q}{40} + 10$ and $p = \frac{8000}{q}$

$$\frac{q}{40} + 10 = \frac{8000}{q} \quad \Big| \cdot q$$

$$\frac{q^2}{40} + 10q = 8000 \quad \Big| \cdot 40$$

$$q^2 + 400q = 320\,000$$

$$q^2 + 400q - 320\,000 = 0$$

$$(q+800)(q-400) = 0 \quad , \; q = 400 \text{ or } \cancel{-800}$$

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Panel 3

A cost function is given as $C(q) = 2q^2 + 10$. Each item sells for \$20. What is the fixed cost? Find the profit function. What is the break-even point?

$C(0) = 10$ is fixed cost, $R(q) = 20q$

$P(q) = R(q) - C(q) = 20q - (2q^2 + 10) =$

$= 20q - 2q^2 - 10$

$P(q) = 0 = -2q^2 + 20q - 10$

$= -2(q^2 - 10q + 5)$

$$q = \frac{10 \pm \sqrt{100 - 20}}{2} = \frac{10 \pm \sqrt{80}}{2}$$

3

Panel 4

#17, 16(

$R(q) = 8.35q$

$C(q) = 2116 + 7.20q$

$P(q) = R - C = 8.35q - 2116 - 7.20q =$

$= 1.15q - 2116$ $= 0$ $= -1150$ $= 4600$

$P(q) = 1.15q - 2116$

$1.15q - 2116 = 4600$

$1.15q = 4600 + 2116 = 6716$

$q = 6716 / 1.15 = \cancel{5318}.$ 5840

4

Panel 5

Chapter 4: Exponential and Logarithm Functions

Recall: Rules of Exponents

b^x = exponential function, Same $b > 0$ ($b^0 = 1$)

$b^x \cdot b^y = b^{x+y}$ $\qquad b^2 \cdot b^3$

$(b \cdot c)^x = b^x \cdot c^x$ $\qquad (bc)^2 = (bc)(bc)$

$b^{-x} = 1/b^x$ (neg. powers = flip it)

$(b^x)^y = b^{xy}$ $\qquad (b^2)^3 = b^2 \cdot b^2 \cdot b^2$

$bb\ bb\ bb$

$b^{1/n} = \sqrt[n]{b}$

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Panel 6

Example: Simplify the following expressions:

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

$$\frac{x^2 + x^3 y^2}{\sqrt{x}\, y} = \left[x^2(1 + xy^2)\right]\left[\cdot x^{-1/2} y^{-1}\right] = x^{3/2}(1 + xy^2)\, y^{-1}$$

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

$$\frac{x^2\, y^{-3}}{\sqrt[4]{x^3}\, y^{-5}} = \frac{x^2 y^5}{y^3\, x^{3/4}} = \frac{y^2 x^{5/4}}{1} = y^2 x^{5/4}$$

$$\frac{a^2 - b^2}{(a+b)^2 a^2} = \frac{(a+b)(a-b)}{(a+b)^2 a^2} = \frac{a-b}{(a+b)a^2}$$

$(a+b)(a-b) = a^2 - b^2$

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Panel 7

Exponential and Logarithm Functions

Def: $f(x) = b^x$, $b > 0$, exponential function with base b.

Ex: Number of bacteria after t minutes is given by

$$N(t) = 300\left(\frac{4}{3}\right)^t$$

a) How many bacteria are present initially?

$$N(0) = 300\left(\frac{4}{3}\right)^0 = \underline{300}$$

b) How many after 3 minutes?

$$N(3) = 300\left(\frac{4}{3}\right)^3 = 300\,\frac{64}{27} =$$

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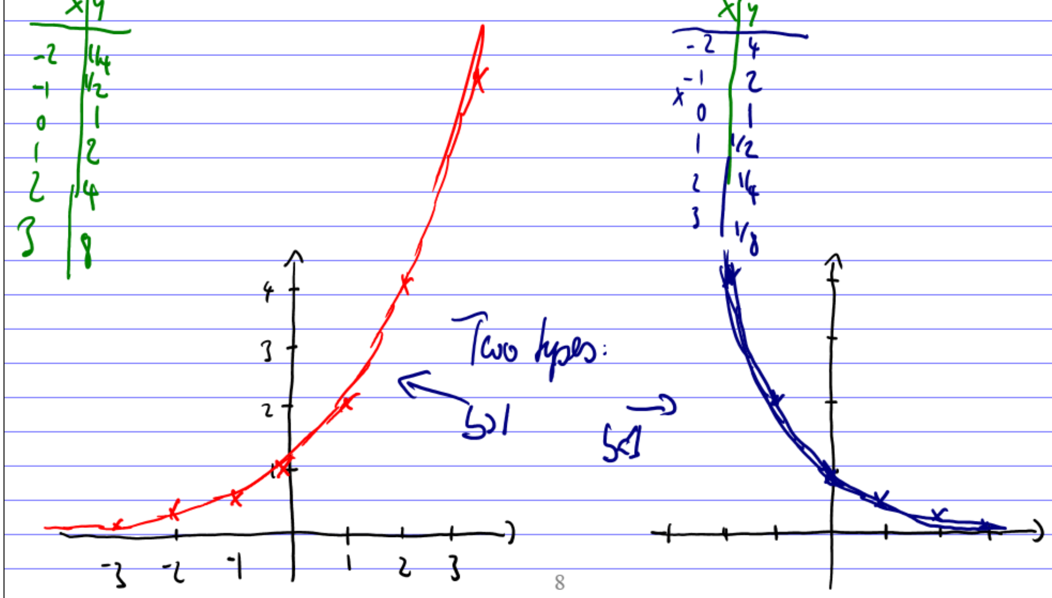
Panel 8

Graphs of Exponential Functions

Graph $f(x) = 2^x$ | Graph $f(x) = \left(\frac{1}{2}\right)^x$

x	y
-2	1/4
-1	1/2
0	1
1	2
2	4
3	8

x	y
-2	4
-1	2
0	1
1	1/2
2	1/4
3	1/8



8

Panel 9

Properties of $f(x) = 5^x$

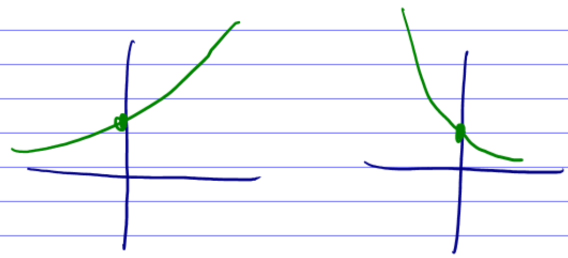
Domain: all numbers

Range: $(0, \infty)$

y-intercept: 1

x-intercept: none

graph



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Panel 10

Exp. function is growing super-fast:

A sultan wanted to reward his wise man for his services and asked: "what do you want?" The wise man thought briefly, then said: "Put one penny on a chess board field and double it for each subsequent field".

$1=2^0$	$2=2^1$	$4=2^2$
$8=2^3$	$16=2^4$	$32=2^5$
$64=2^6$	$128=2^7$	2^8

How much money does wise man get?

$\$\ 2^{63}$

9223372036854775808

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Panel 11

The compound amount S of a principle P at the end of n interest periods at a rate r per period is

$$S(n) =$$

Ex: \$1000 invested over 10 years at 6% annually:

\$1000 over 10 years at 6% annually, compounded monthly

\$1000 over 10 years at 6% annually, compounded daily:

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Panel 12

The compound amount S of a principle P at the end of n interest periods at a rate r per period is

$$S(n) =$$

Ex: \$1000 invested over 10 years at 6% annually:

\$1000 over 10 years at 6% annually, compounded monthly

\$1000 over 10 years at 6% annually, compounded daily:

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Panel 13

Application: Compound Interest

Suppose \$100 is invested at 5% interest, compounded annually. Find total amount after 2 years:

Year 0: 100, Year 1: $100 + 0.05 \cdot 100 = 105$, Year 2: $105 + 0.05 \cdot 105 = \underline{110.25}$

In General: principle P, rate r.

year 0: P

1: $P + rP = P(1+r)$

2: $\underbrace{P(1+r)}_{1} + r\,P(1+r) = P(1+r)(1+r) = P(1+r)^2$

3: $P(1+r)^3$

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Panel 14

The compound amount S of a principle P at the end of n interest periods at a rate r per period is

$$S(n) = P(1+r)^n$$

Ex: \$1000 invested over 10 years at 6% annually:

$$S(10) = 1000 \cdot (1+0.06)^{10} = \underline{1790.85}$$

\$1000 over 10 years at 6% annually, compounded monthly

$$S(10) = 1000\left(1+\frac{0.06}{12}\right)^{120} = 1819.40$$

\$1000 over 10 years at 6% annually, compounded daily:

$$S(10) = 1000\left(1+\frac{0.06}{365}\right)^{365 \cdot 10} = \underline{\$1822.03}$$

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