

2.

Year	1990	2002
GDP ($\times 10^9$)	100	150

• Increasing exponentially.

• Find GDP in 2010.

1st re-label time starting at $t=0$

	1990	2002	2010
Year	$t=0$	$t=12$	$t=20$
$y(t)$, GDP	100	150	$y=?$

note in 1991 $t=1$, $\frac{1991-1990}{1} = 1$

$\Rightarrow$ in 2002 $t = 2002 - 1990 = 12$

in 2010 $t = 2010 - 1990 = 20$

Now find Exponential growth function using known values for $t=0$, and $t=12$

$$y(t) = A e^{kt} \quad \text{find } A \text{ and } k$$

$$t=0 \quad 100 = A e^{k \cdot 0} = A \cdot e^0 = A \Rightarrow \boxed{A=100}$$

so for $y(t) = 100 e^{kt}$ use $t=12$ data to find k .

$$150 = 100 e^{k \cdot 12} \quad \text{solve for } k$$

$$1.5 = e^{12k}$$

$$\ln 1.5 = \ln(e^{12k}) = 12k$$

$$\text{gives } \boxed{k = \frac{\ln(1.5)}{12}}$$

$$\Rightarrow \boxed{y(t) = 100 e^{\frac{\ln(1.5)}{12} t}} \quad \text{Now use this to predict GDP } (\times 10^9) \text{ for other years.}$$

(3)