1) After examining the created graph and rate of change of the data, I believe an exponential function would best represent the data. The rate of change is increasing, thus indicating exponential function, or at least non-linear. But just by the shape of the formed graph I can see that the dependent variable is increasing at a faster rate.

2) $\boxed{Y = 585.66x + 35{,}472.9}$ First I chose two representative points and then plugged them into the formula $y = mx + b$; using substitution, I substituded the b value and solved for slope (m). After that I could easily find my b value, or yintercept.

$21922 = m(98) + b$
$2595 = m(65) + b$
$-m(65) \quad -m(65)$
$2595 - m(65) = b$

$21922 = 95m + 2595 - 65m$
$-2595 \qquad -2595$
$\frac{19327}{33} = \frac{33m}{33}$

$585.66 = m$

$2595 = 585.66(65) + b$

$\boxed{m = 585.66 \quad b = 35{,}472.9}$

3) Since a exponential model has 3 parameters, I had to use 3 equations to use the substitution method. But first I determined that my "b" parameter was 0 because the asymptote lies on $y = 0$, so all I needed to find was 2 parameters, so all I needed was two equations. I chose two points that I thought represented the graph well – (82, 8882) & (60, 2150), plugged them both into the exponential equations and with mathematica solved for the two parameters.

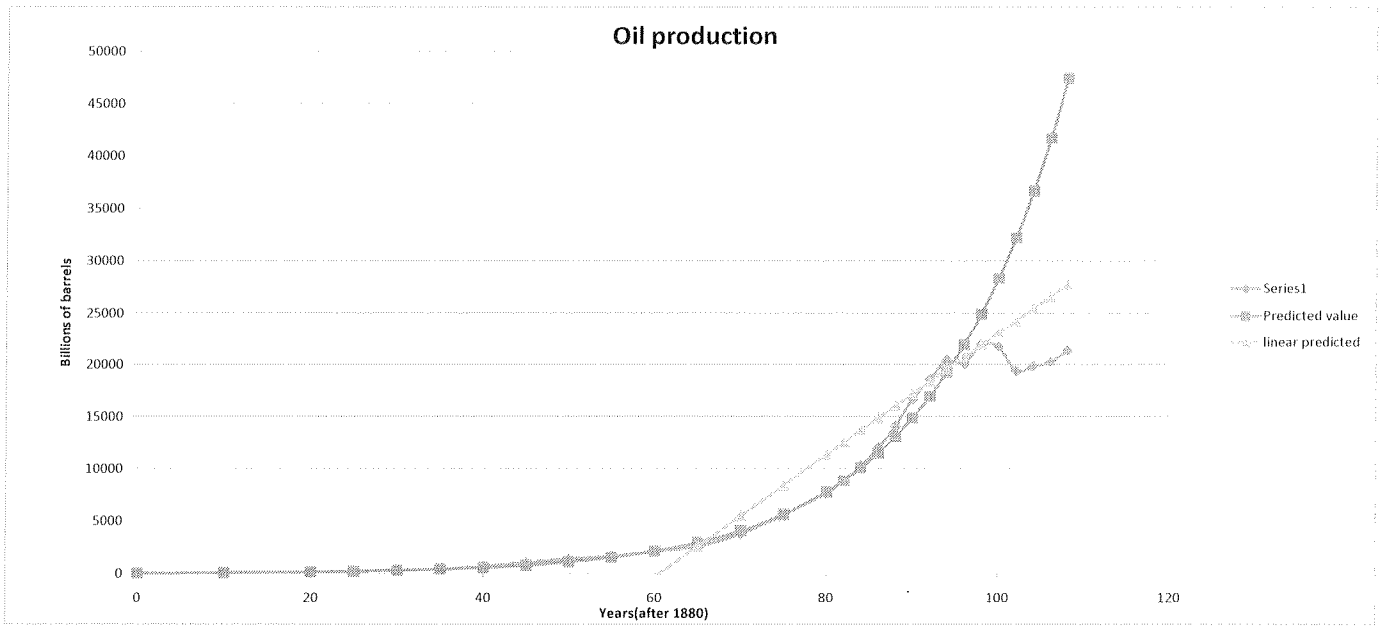
$a \rightarrow 44.8995$
$b \rightarrow 1.0666$

$\boxed{Y = 44.8995(1.0666)^x}$

4) By calculating SSE of each, linear & exponential model to the actual data, I found the exponential model, having a lower SSE, to be the desired prediction model. All I needed to do was compare the two SSE's to achieve this conclusion, since SSE is only a comparitive value and since the SSE was lower in exponential, that is considered <u>only</u> to be better than the linear model.

Year	Years since 1880	MBBI	Rate of change	Exponential function	Linear function
1880	0	30		44.8995	-35472.9
1890	10	77	47	85.55734481	-29616.3
1900	20	149	72	163.0320884	-23759.7
1905	25	215	66	225.0510214	-20831.4
1910	30	328	113	310.6625374	-17903.1
1915	35	432	104	428.8414758	-14974.8
1920	40	689	257	591.9767889	-12046.5
1925	45	1069	380	817.1703028	-9118.2
1930	50	1412	343	1128.029538	-6189.9
1935	55	1655	243	1557.142538	-3261.6
1940	60	2150	495	2149.49414	-333.3
1945	65	2595	445	2967.18184	2595
1950	70	3803	1208	4095.925597	5523.3
1955	75	5626	1823	5654.054049	8451.6
1960	80	7674	2048	7804.909155	11379.9
1962	82	8882	1208	8879.142198	12551.22
1964	84	10310	1428	10101.22791	13722.54
1966	86	12016	1706	11491.51607	14893.86
1968	88	14104	2088	13073.15731	16065.18
1970	90	16690	2586	14872.48864	17236.5
1972	92	18584	1894	16919.47195	18407.82
1974	94	20389	1805	19248.19294	19579.14
1976	96	20118	271	21897.42876	20750.46
1978	98	21922	1804	24911.29363	21921.78
1980	100	21722	200	28339.97347	23093.1
1982	102	19411	2311	32240.56159	24264.42
1984	104	19837	426	36678.00934	25435.74
1986	106	20246	409	41726.2077	26607.06
1988	108	21338	1092	47469.21766	27778.38

	Squared error(exp.	Squared error(linear)
	221.9951003	1.26E+09
	73.22815022	8.82E+08
	196.8995036	5.72E+08
	101.0230319	4.43E+08
	300.5876087	3.32E+08
	9.976275332	2.37E+08
	9413.503489	1.62E+08
	63418.19638	1.04E+08
	80639.22318	57788884
	9576.082942	24172956
	0.255893962	6166779
	138519.3218	0
	85805.40532	2959432
	787.0296721	7984015
	17137.20692	13733695
	8.167034769	13463175
	43585.78713	11645429
	275083.3972	8282078
	1062636.642	3846227
	3303347.534	298662.2
	2770653.644	31039.39
	1301440.744	655873.2
	3166366.699	400005.7
	8935876.381	0.0484
	43797572.91	1879915
	164597650.7	23555686
	283619595.7	31345890
	461399322.8	40463084
	682840536.5	41478495
SSE=	1657519878	4.28E+09


Oil production
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Billions of barrels
0
20
40
60
80
100
120
Years(after 1880)
Series1
Predicted value
linear predicted