

請詳細回答下列問題。

1. (a) Find an equation of the line tangent to the graph of $f(x) = x^2 + 2x - 4$ at the point $(0, -4)$. (10%)
(b) Find all relative extreme values of $f(x) = 2x^3 - 3x^2 - 12x + 2$. (10%)
2. Find the limit $\lim_{x \rightarrow 2} \frac{\sqrt{x+2}-x}{x^2-2x}$ if it exists. (10%)
3. (a) Evaluate the integral $\int_0^1 \frac{x^2}{x^2+1} dx$. (10%)
(b) Evaluate the integral $\int_0^\infty te^{-st} dt$ for $s > 0$. (10%)
(c) Evaluate the integral $\int \frac{\ln x}{x^2} dx$. (10%)
4. (a) Let $f(x, y) = e^{xy} + x^2 \ln y$. Find all first-order and second-order partial derivatives of f . (10%)
(b) Find all critical points for $f(x, y) = x^2 - 3xy - y^2 + 2$ and determine whether each corresponds to a relative maximum, a relative minimum, or a saddle point. (10%)
5. (a) Let $R = \{(x, y) | 0 \leq x \leq 2, 1 \leq y \leq 3\}$. Evaluate the double integral $\iint_R (2x - xy) dA$. (10%)
(b) Let $R = \{(x, y) | 0 \leq x \leq 1, x^2 + y^2 \leq 1\}$. Evaluate the double integral $\iint_R xy dA$. (10%)

全卷完

一. 翻譯, 每題 10 分 (英翻中)

3/1

1. Seawater is water from a sea or ocean. On average, seawater in the world's oceans has a salinity of about 3.5% (35 g/L, or 599 mM). This means that every kilogram (roughly one liter by volume) of seawater has approximately 35 grams (1.2 oz) of dissolved salts (predominantly sodium (Na^+) and chloride (Cl^-) ions). The average density of seawater at the ocean surface is 1.025 g/ml.
2. Barack Obama (born August 4, 1961) is the 44th and current President of the United States. He is the first African American to hold the office. Obama previously served as a United States senator from Illinois, from January 2005 until he resigned following his victory in the 2008 presidential election. A native of Honolulu, Hawaii, Obama is a graduate of Columbia University and Harvard Law School.
3. A typhoon is a mature tropical cyclone that develops in the northwestern part of the Pacific Ocean. This region is referred to as the northwest Pacific basin. For organizational purposes, the northern Pacific Ocean is divided into three regions: the eastern (North America to 140°W), central (140°W to 180°), and western (180° to 100°E). Identical phenomena in the eastern north Pacific are called hurricanes.
4. Photosynthesis is a chemical process that converts carbon dioxide into organic compounds, especially sugars, using the energy from sunlight. Photosynthesis occurs in plants, algae, and many species of bacteria, but not in archaea. Photosynthetic organisms are called photoautotrophs, since they can create their own food. In plants, algae, and cyanobacteria, photosynthesis uses carbon dioxide and water, releasing oxygen as a waste product.
5. Global warming is the current rise in the average temperature of Earth's oceans and atmosphere. The scientific consensus is that global warming is occurring and was initiated by human activities, especially those that increase concentrations of greenhouse gases in the atmosphere, such as deforestation and burning of fossil fuels. This finding is recognized by the national science academies of all the major industrialized countries and is not rejected by any scientific body of national or international standing.
6. An energy crisis is any great bottleneck (or price rise) in the supply of energy resources to an economy. In popular literature though, it often refers to one of the energy sources used at a certain time and place, particularly those that supply national electricity grids or serve as fuel for vehicles. There has been an enormous increase in the global demand for energy in recent years as a result of industrial development and population growth. Supply of energy is, therefore, far less than the actual demand.
7. Ocean acidification is the name given to the ongoing decrease in the pH of the Earth's oceans, caused by their uptake of anthropogenic carbon dioxide from the atmosphere. Between 1751 and 1994, surface ocean pH is estimated to

2/2
have decreased from approximately 8.25 to 8.14, representing an increase of approaching 30% in "acidity" (H^+ ion concentration) in the world's oceans.

二. 英文寫作, 每題 15 分

1. Use 10 sentences to describe an elephant.
2. Use 10 sentences to describe National Sun Yat-sen University (中山大學)