微積分(乙)(上)第二次期中考 2018/12/07

1. ~~50%~~ 60% Find the derivative of (a) $\frac{(2x^2+3)(5x+2)}{6x-7}$, (b) $(3x^2-7)^{2/3}$, (c) $\frac{x^2+4x}{(3x^3+2)^4}$, (d) $e^{x^2/(x^3+2)}$, (e) $\log_2\left((2x^2-x)^{5/2}\right)$, (f) $\frac{\ln(3x)}{x^2}$, (g) $(x^2+1)^{5x}$, (h) $\frac{\cos^2 x}{1-\cos x}$, (i) $\ln|5\sin x|$, and (j) $\frac{e^{\sqrt{x}}}{\ln(\sqrt{x}+1)}$.

2. 10% Let $f(x)=6x+7x^{6/7}$. Find the x-value of all points where $f(x)$ has any relative extrema. Find the values of any relative extrema.

3. 10% The total profit $P(x)$ (in thousands of dollars) from the sale of x units of a certain prescription drug is given by $P(x)=\ln(-x^3+3x^2+72x+1)$ for x in $[0,10]$.
   (a) Find the number of units that should be sold in order to maximize the total profit.
   (b) What is the maximum profit?

4. 10% The demand equation for one type of heavy machinery is $p=D(q)=36qe^{-0.0025q^2}$, where p is the price (in thousands of dollars) and q is the quantity sold per month. Find the values of q and p that maximize revenue.

5. 10% Under the scenario that the fertility rate in the European Union remains at 1.8 until 2020, when it raises to replacement level, the predicted population (in millions) of the 15 member countries of the EU can be approximated over the next century by

~~6. 10%~~ $P(t) = 325 + 7.475(t+10)e^{-(t+10)/20}$ where t is the number of years since 2020.

(a) In what year is the population predicted to be largest? What is the population predicted to be in that year?

(b) In what year is the population declining most rapidly?

(c) What is the population approaching as time goes on?