

1	2	3	4	5	6	Total

Math 101 Exemption Exam

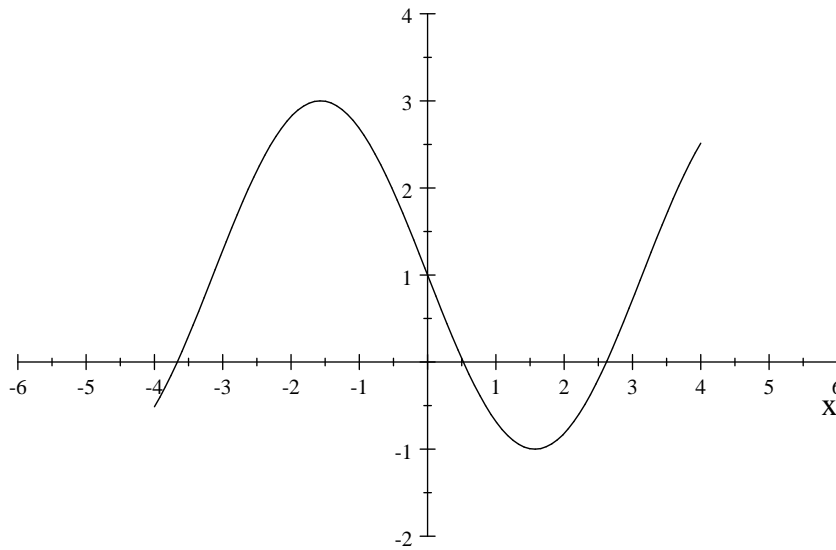
29.09.2010

Duration(90 minutes)

Name:

Student Number:

1. (10 pts) The graph of a function  $f(x)$  is given below. Sketch the graph of the function  $g(x) = -\frac{1}{2}f(x+2) + 1$ .

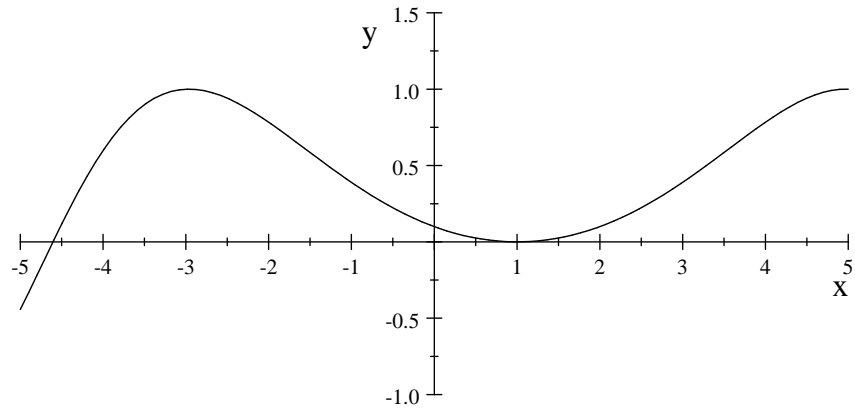


2. (15 pts) Find the points at which the function  $f(x) = x^3 - 9x^2 - 48x + 52$  attains its local maximum, local minimum, and global maximum on the interval  $(-3, 10)$ , if they exist.

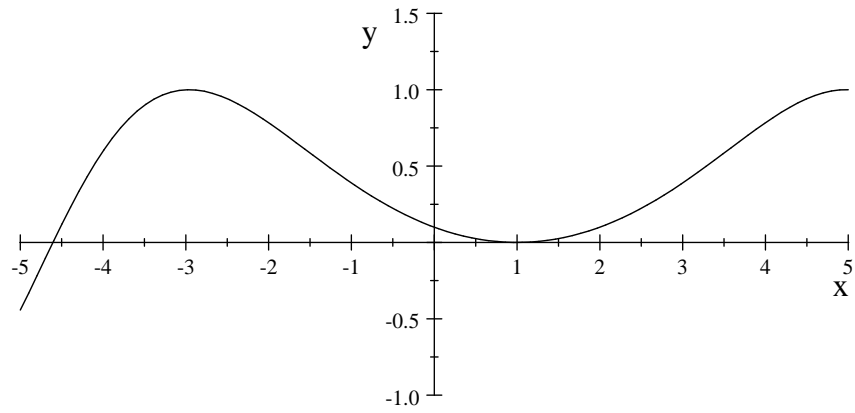
3. (10pt) Of all the cylinders with volume  $8\text{cm}^3$  what are the dimensions of the one which has the maximum surface area. (No need to simplify your answer.)

4. (15 pts) The graph of a function  $g(x)$  is given below.

(a) Sketch the graph of its antiderivative.



(b) Sketch the graph of  $g'$ , the derivative of  $g$ .



5. (20 pts) Determine whether the statements below are true or false. Explain your answer. CORRECT ANSWERS WITHOUT ANY JUSTIFICATION WILL NOT GET CREDIT.

(a) The area under the curve  $f(x) = \frac{1}{1+x^2}$  and above the x-axis is infinite.

(b) The graph of the function  $f(x) = x^4 - x^3$  changes from being concave up to concave down at  $x = 0$ .

(c) The function  $f(x) = \begin{cases} x \sin(\frac{1}{x}) & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$  is continuous at  $x = 0$ .

(d) Let  $f$  be a differentiable function such that  $f(1) = 1$  and  $f'(1) = 2$ . Then the best linear approximation to  $f$  at  $x = 1$  is  $g(x) = 1 + 2x$ .

6. (30 pts) Evaluate the following:

(a)  $\lim_{x \rightarrow \infty} \frac{e^x + x^2}{2e^x + x}$

(b)  $\lim_{x \rightarrow 0} \frac{\cos(x) - 1}{x^2}$

(c)  $\frac{d}{dx} (\sin(\cos(x)))$

(d)  $\int x \sin(x) dx$

(e)  $\int \frac{e^t + 1}{e^t + t} dt$

(f)  $\frac{d}{dx} \int_0^{x^2} \tan(y) dy$