Final Exam PART A, Dec., 2005 SHOW ALL WORK
Math 25 Calculus I Either circle your answers or place on answer line.

All problems required on this part of the exam.

1.) Suppose $f(x) = x + 1$ and $g(x) = x^2 - x - 14$.

[3] 1a.) Set up, **but do NOT evaluate**, an integral for the area of the region enclosed by f and g.

[4] 1b.) Set up, **but do NOT evaluate**, an integral for the volume of the solid obtained by rotating the region bounded by the curves f and g about the line $x = 12$ (hint: use cylindrical shells).

[4] 1c.) Set up, **but do NOT evaluate**, an integral for the volume of the solid obtained by rotating the region bounded by the curves f and g about the line $y = -20$ (hint: use washers).

[4] 2.) $\Sigma_{i=1}^{100} 3 =$ ____________

[10] 3.) Find the derivative of $g(x) = ln[\sqrt{x^2 sin(x)}]$

Answer 3.) ____

4.) Find the following integrals:

[10] a.) $\int_0^{\frac{\pi}{2}} \frac{cos(x)}{3sin(x)+8} dx =$ ______________________________

[10] b.) $\int x\sqrt{1+2x}dx =$ ______________________________

5.) Find the following for $f(x) = \frac{x+6}{\sqrt{x+2}}$ (if they exist; if they don't exist, state so). Use this information to graph f.

Note $f'(x) = \frac{x-2}{2(x+2)^{\frac{3}{2}}}$, $f''(x) = \frac{-x+10}{4(x+2)^{\frac{5}{2}}}$,

$\frac{6}{\sqrt{2}} \sim 4.24$, $\frac{8}{\sqrt{3}} \sim 4.6$, $\frac{9}{\sqrt{5}} \sim 4$, $\frac{11}{\sqrt{7}} \sim 4.16$.

[1] 5a.) critical numbers: ____________________

[1] 5b.) local maximum(s) occur at $x =$ ____________________

[1] 5c.) local minimum(s) occur at $x =$ ____________________

[1] 5d.) The global maximum of f on the interval $[0, 5]$ is _______ and occurs at $x =$ ____________

[1] 5e.) The global minimum of f on the interval $[0, 5]$ is _______ and occurs at $x =$ ____________

[1] 5f.) Inflection point(s) occur at $x =$ ____________________

[1] 5g.) f increasing on the intervals ____________________

[1] 5h.) f decreasing on the intervals ____________________

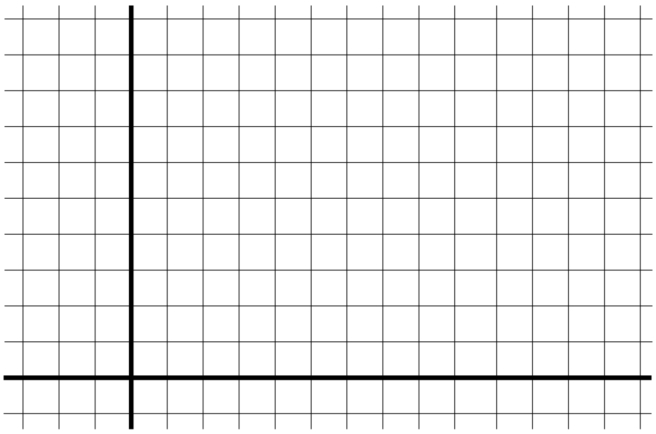
[1] 5i.) f is concave up on the intervals ____________________

[1] 5j.) f is concave down on the intervals____________________

[1] 5k.) What is the domain of f? ____________________

[1] 5l.) What is the range of f? ____________________

[4] 5m.) Graph f



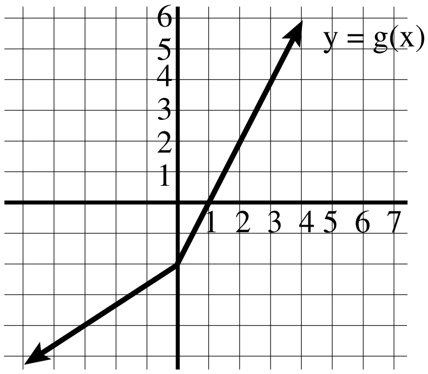
Final Exam PART B, Dec., 2005 SHOW ALL WORK

Math 25 Calculus I Either circle your answers or place on answer line.

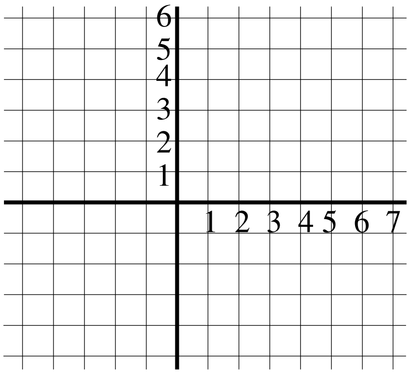
Choose 4 out of the following 5 problems: **Clearly indicate which 4 problems you choose.** Each problem is worth 10 points You may do all the problems for up to five points extra credit.

I have chosen the following 4 problems: ______________________________

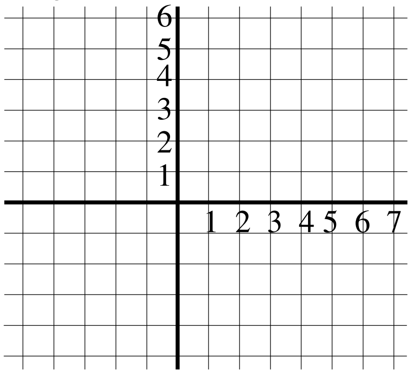
A.) Given the graph of y = g(x) below, draw the following graphs:



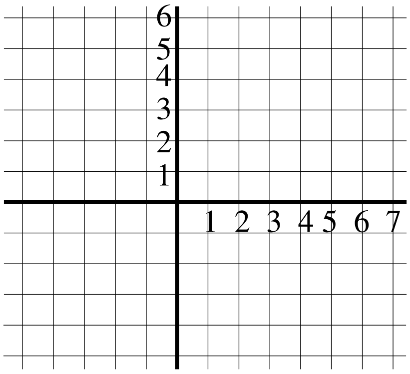
$y = g(x-1)$



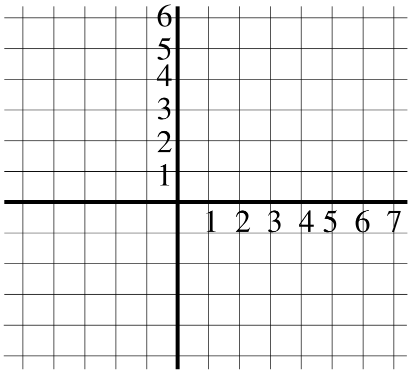
$y = \dfrac{1}{g(x)}$



$y = g^{-1}(x)$



$y = g'(x)$



B.) Find the linearization, $L(x)$, of the function $f(x) = x^{\frac{1}{3}}$ when $x = 8$

Answer B.) ______________________________

C.) Find the following limit (SHOW ALL STEPS): $lim_{x \to +\infty} \left(\frac{x}{x+1} \right)^x =$ ____________

D.) Suppose a poster has 1 cm side margins and 2 cm top and bottom margins. If the area of printed material is 200 cm^3, find the dimensions of the poster with the smallest area.

Answer D.) ____________________

E.) A car is 2 miles north from a bicyclist. If the car is traveling north at 40 mph and the bicyclist is traveling east at 10 mph, how fast is the distance between them changing after 3 hours.

Answer E.) ______________________________

Final Exam Part C, Dec., 2005 SHOW ALL WORK
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Note the proof problems on this page are completely optional. You may choose to prove one (and only one) of the following statements. If you choose to do one of the following problems, it can replace your lowest point problem in the optional section OR 80% of your lowest point problem in the required section. If you chose to do one of the following problems, clearly indicate your choice.

I have chosen the following problem: ____________________

I.) State the ϵ, δ definition of limit and use it to prove that $lim_{x \to 2}(x + 3) = 5$.

II.) Prove that $lim_{x \to a}(f + g)(x) = lim_{x \to a} f(x) + lim_{x \to a} g(x)$