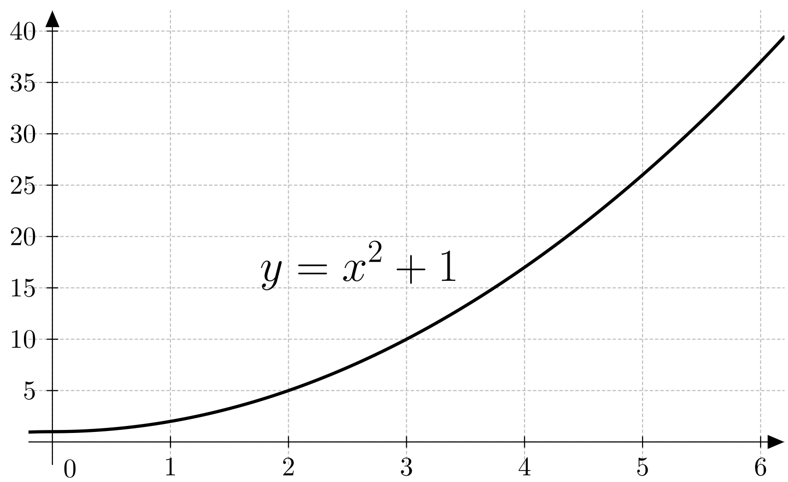
Name ______________________ Signature ______________________

Math 220 – Exam 3 – November 12, 2014

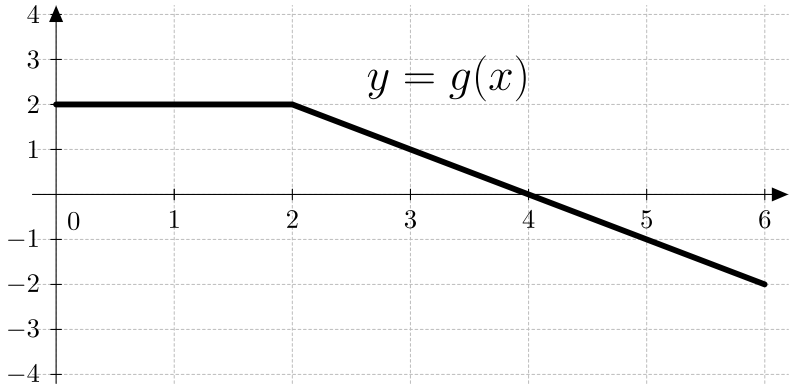
1. (8 points) Use a linearization for the function $f(x) = e^x$ at $x = 0$ to approximate $e^{-.01}$.

2. (8 points) Find the absolute minimum and maximum of $m(x) = 2x^3 - 6x + 4$ on the interval [0,2].



3. (8 points) Estimate $\int_0^6 (x^2 + 1)\,dx$ by using $n = 3$ subintervals, taking the sampling points to be midpoints. In the language of our textbook, this is M_3. Also, illustrate the rectangles on the graph above.

4. (3 points) Find the differential dy if $y = \ln(x)$.



5. (2 points each) The graph of $y = g(x)$ is shown above. Evaluate the following definite integrals. (You do not need to show your work.)

A. $\displaystyle\int_0^2 g(x)\,dx =$

B. $\displaystyle\int_2^4 g(x)\,dx =$

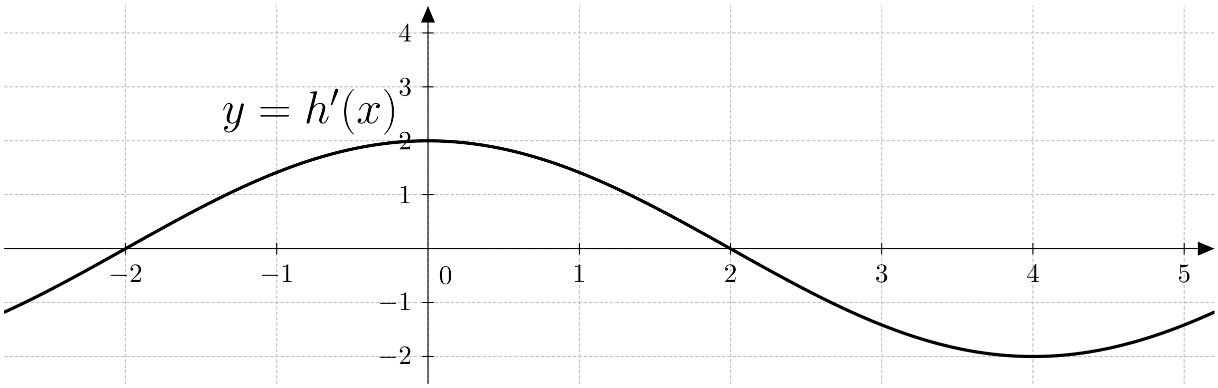
C. $\displaystyle\int_4^6 g(x)\,dx =$

D. $\displaystyle\int_0^6 g(x)\,dx =$

6. (4 points each) Find the following most general antiderivatives. I hope that you 'C' what I mean.

A. $\displaystyle\int \left(\cos(x) + 4x + \frac{1}{x}\right)\,dx =$

B. $\displaystyle\int \left(3e^x + 4\sin(x) + 7\sec^2(x)\right)\,dx =$



7. (2 points each) $y = h'(x)$ is plotted above. Find the following:

A. Interval(s) where $h(x)$ is increasing: ____________________

B. Interval(s) where $h(x)$ is decreasing: ____________________

C. x-coordinate(s) where $h(x)$ has a local max: ____________________

D. x-coordinate(s) where $h(x)$ has a local min: ____________________

E. Interval(s) where $h(x)$ is concave up: ____________________

F. Interval(s) where $h(x)$ is concave down: ____________________

G. x-coordinate(s) where $h(x)$ has an inflection point: ____________________

8. (3 points each) For the function $w(x)$, one has $w''(x) = \dfrac{2(x-1)}{x^2+3}$. Find the following:

A. Interval(s) where $w(x)$ is concave up: ____________________

B. Interval(s) where $w(x)$ is concave down: ____________________

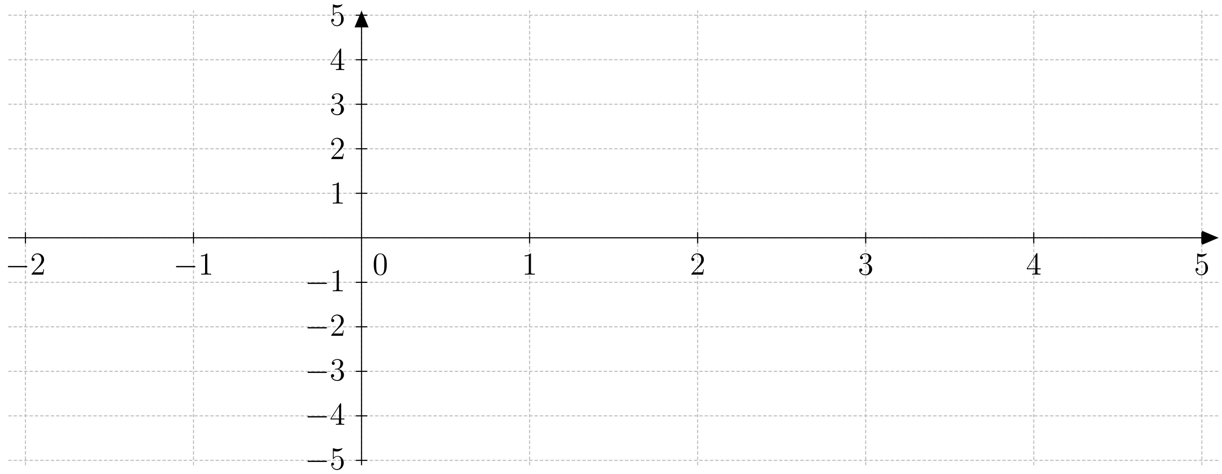
C. x-coordinate(s) where $w(x)$ has an inflection point: ____________________

9. (10 points) A homeowner with 16 feet of fencing wants to enclose a rectangular area against the side of her house. What dimensions will maximize the fenced-in area? (Note that three sides of the rectangle will be formed from fencing, and the house will serve as the fourth side of the rectangle. Make sure to justify why your answer corresponds to the absolute maximum.)

10. (8 points) Find $v(x)$ if $v''(x) = 6x + 2$, $v'(0) = 1$, and $v(0) = 2$.

11. (6 points) Draw the graph of a function $k(x)$ that satisfies:

- $k'(x) > 0$ for $x < 1$ and $x > 3$,
- $k'(x) < 0$ for $1 < x < 3$,
- $k''(x) > 0$ for $x < 0$ and $x > 2$,
- $k''(x) < 0$ for $0 < x < 2$.



12. (10 points) A rectangular open-topped box is to have a square base and volume 12 ft^3. If material for the base costs \$3 per ft^2 and material for the sides costs \$1 per ft^2, what dimensions minimize the cost of the box? (Justify why your answer is an absolute minimum.)