Homework 1 1/14: MATH 112-1 Prof. Maxwell Auerbach

Show all work. No credit will be given for answers without sufficient work. No calculators are allowed. Collaboration with classmates is allowed, but all work submitted must be written out and explained by you.

1 Homework 1 Problems: Calculus Review

Find the following expressions. You do not need to simplify your answers.

1.1 For $g(x) = \ln(x^2 - 4)$, find $g'(x)$.

1.2 Find $\frac{d}{dx}\sqrt[5]{x^8}$.

1.3 Evaluate $\int_0^1 (u+2)(u-3)\,du$.

1.4 For $f(t) = e$, find $\int f(t)\,dt$.

1.5 For $f(x) = x^{13}$, find $f''(x)$.

1.6 Find $\int \frac{\sec^2(x)}{\tan^2(x)}\,dx$

1.7 Evaluate $\int_{\pi^2/4}^{\pi^2} \frac{\cos(\sqrt{x})}{\sqrt{x}}\,dx$

1.8 For $f(x) = x^{3x}$, find $\frac{d}{dx}f(x)$.

2 Homework 1 Problems: Word Problems

2.1 The velocity of a satelite in space is described by the function $v(t) = (t-5)^2$ meters/minute where t is minutes since launch.

2.1 a) What does $\int_1^4 v(t)\,dt$ represent in terms of meters?

2.1 b) Evaluate $\int_1^4 v(t)\,dt$.

2.2 Frank the squirrel is adding nuts to his stash at a rate that is described as $f(x) = 3x^2 + 5x + 4$ nuts per day for four days starting at day 0. Gerry the squirrel is taking nuts from Frank's stash as a rate that is described as $g(x) = x + 1$ nuts per day for four days starting at day 0.

2.2 a) What is the total rate in nuts per day that Frank's stash changes?

2.2 b) Find the most general antiderivative of the total rate that Frank's stash changes.

2.2 c) If at the end of four days Frank has 111 nuts, how many nuts did he start out with?

2.2 d) Find the total number of nuts that Gerry stole from Frank.

Extra Problems 1/14: MATH 112-1 Prof. Maxwell Auerbach

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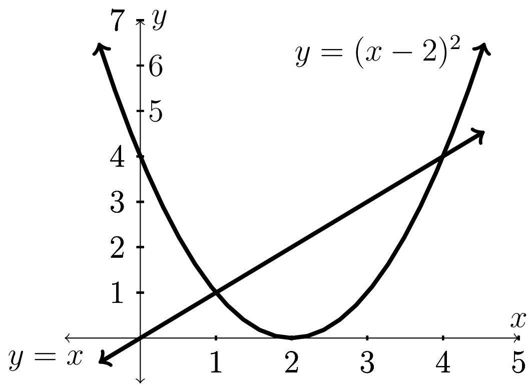
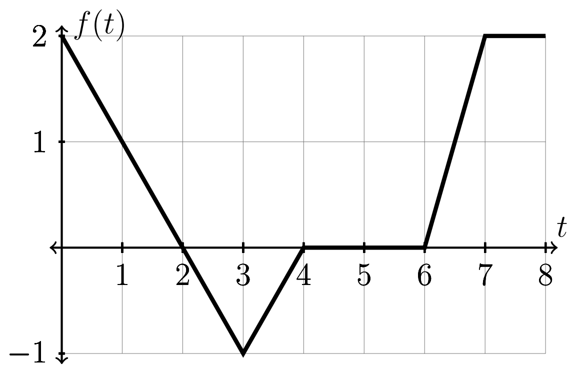
3 Extra Problems: example

3.1 Solve the graph related problems below.

3.1 a) Find the area between the curves $y = (x-2)^2, y = x$



3.1 b) Find $\int_0^8 f(t)dt$



3.2 Let $f(x) = 2x^{\sin x}$.

3.2 a) Find an expression equal to $\ln(f(x))$.

3.2 b) Use logarithmic differentiation to compute $f'(x)$.

3.3 Let $f(x) = e^{\sin(x)+\cos(x)}$.

3.3 a) Use chain rule to find $f'(x)$?

3.3 b) Simplify then use product rule to find $f'(x)$.

3.4 Let $f(x) = e^x$, $g(x) = x^2$, $h(x) = \ln(x), j(x) = 3x^2 - x + 1$. Find the following limits, or state if they are infinity or do not exist. Cite any theorems or rules used.

3.4 a) $\lim_{x\to\infty} \frac{f(x)}{g(x)}$

3.4 c) $\lim_{x\to-\infty} \frac{j(x)}{f(x)}$

3.4 e) $\lim_{x\to 0} \frac{g(x)}{h(x)}$

3.4 b) $\lim_{x\to\infty} \frac{h(x)}{g(x)}$

3.4 d) $\lim_{x\to-\infty} \frac{j(x)}{g(x)}$

3.4 f) $\lim_{x\to 0} \frac{j(x)}{f(x)}$

3.5 The rate of growth of a fish population was modeled by the equation

$$G(t) = \frac{60,000e^{-.6t}}{(1+5e^{-.6t})^2}$$

where t is measured in years since 2002 and G in kilograms per year. If the biomass was $25,000$ kg in the year 2002, what is the predicted biomass for the year 2020?