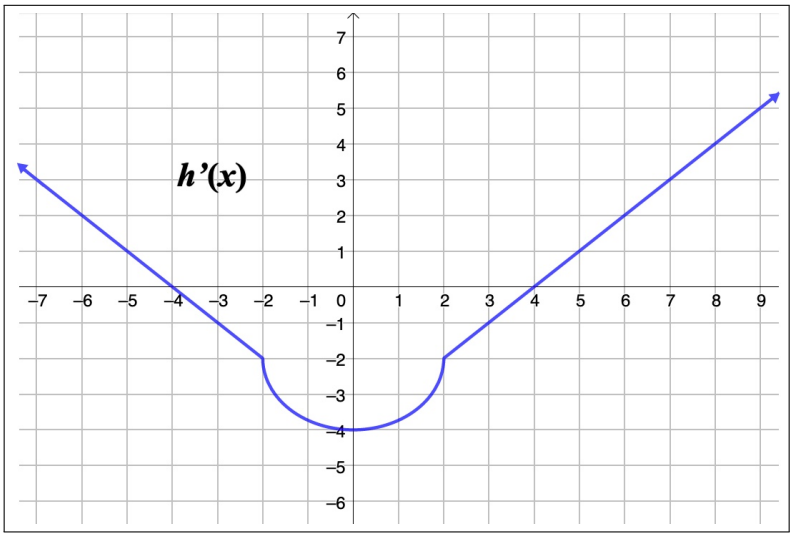
Session 10: Review Exam #3

1. Use the graph of $h'(x)$ below to find $\int_{-4}^{2} h'(x)\,dx$.



2. Given $f(x) = 4x - \frac{1}{2}x^2$. Use the Riemann Sums indicated to find the approximation of the area under the curve.

   (a) Left-hand Riemann sum on the interval $[2, 8]$, using 3 equal subintervals.

   (b) Right-hand Riemann sum on the interval $[2, 8]$, using 3 equal subintervals.

3. Given that $f(x)$ is a continuous function, $\int_1^{10} f(x)\,dx = -4$, and $\int_{10}^{6} f(x)\,dx = -25$, find $\int_1^6 (7 + f(x))\,dx$.

4. For a continuous and differentiable function $f(x)$, if $\displaystyle\int_a^b f'(x)\,dx = 17$ and $f(b) = 9$, find $f(a)$.

5. Evaluate $\displaystyle\int_1^4 \left(3e^x - \frac{6}{\sqrt{x}}\right)\,dx$.

6. Find $\displaystyle\int_0^3 x\sqrt[3]{8+x^2}\,dx$.

7. Find $\int_0^2 x^2 e^{x^3+1} dx$

8. The marginal cost function for a company is given by $C'(x) = 20x + \dfrac{26}{\sqrt{13x+160}}$ dollars per item, where x is the number of items produced. Calculate the change in total cost when production increases from 36 to 50 items. Round your answer to the nearest cent.

9. Find $\int_1^b \frac{2}{x^2}\,dx$, where b is a real number and $b > 1$?

10. Locate the values where $f(x) = x^3 - 3x^2 - 9x + 5$ attains the absolute maximum and absolute minimum on the interval

(a) $[-2, 4]$

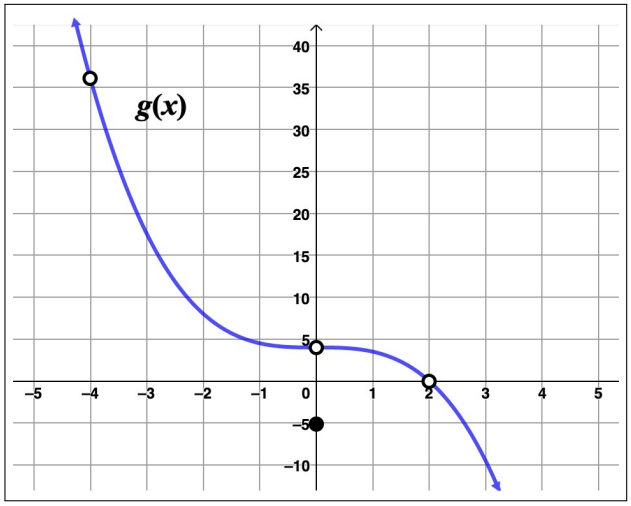
(b) $(-5, 4]$

11. Determine two positive numbers whose sum is 12 and such that the product of one of them and the square of the other is a maximum.

12. Bob needs to fence in a right-angled triangular region that will border a (mostly straight) river. The fencing for the left border costs \$9 per foot, and the lower border costs \$3 per foot. Bob doesn't need any fencing along the side of the river. He has \$630 to spend. Find the dimensions of the triangular region that allows Bob to fence as much area as possible, and then find the area of the region? (Hint: Design this region so the river is along the longest side of the triangular region.)

13. Bike Tykes is a company that makes bikes for children. The company's weekly marginal profit function is given by $P'(x) = 30x - 0.3x^2 - 250$ dollars per bike when x bikes are sold. If the profit from selling 9 bikes is \$0 (i.e., the break-even quantity is 9 bikes), find the company's profit when 80 bikes are sold in a week.

14. Use the graph of $g(x)$ below to find the absolute extrema of $g(x)$ on $(-4, 2)$.



15. Evaluate $\int (x^2 + 1)(3x + 4)\, dx$

16. To evaluate the indefinite integral $\int \frac{e^{2x}}{(e^{2x}+1)^3}\,dx$ we can use the u-substitution method for integrals. When using this method, which equation is the best choice for u?

(a) $u = e^{2x}$

(b) $u = 2x$

(c) $u = e^{2x} + 1$

(d) $u = (e^{2x} + 1)^3$

(e) $u = x$

17. The indefinite integral $\int \frac{5}{x \ln x}\,dx$ is in terms of x and represents the most general antiderivative with respect to x. To evaluate the integral, we can use the u-substituion method for integrals. After making the substitution for u, which of the following integrals correctly represents the modified integral all in terms of u?

(a) $\int \frac{5}{u \ln u}\,du$

(b) $\int \frac{5}{u}\,du$

(c) $\int \frac{5}{x^2 u}\,du$

(d) $\int \frac{5}{xu}\,du$

(e) $\int \frac{5}{\ln u}\,du$