MATH 128 Exam 1 Review QUESTIONS: These are questions from several part exams.

1. Calculate: $\int (x-2)(x+3)dx.$

2. Calculate: $\int \frac{x+1}{2x^2+4x+5}dx.$

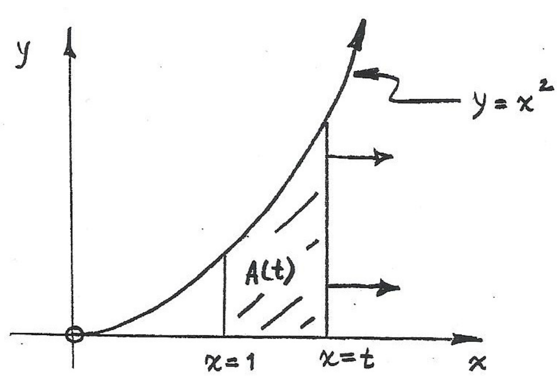
3. Let $f(x)$ be any positive differentiable function. Then: $\int \sqrt{1+f(x)}f'(x)dx = ?$

4. Calculate with integration by parts: $\int \ln(x^2)dx$.

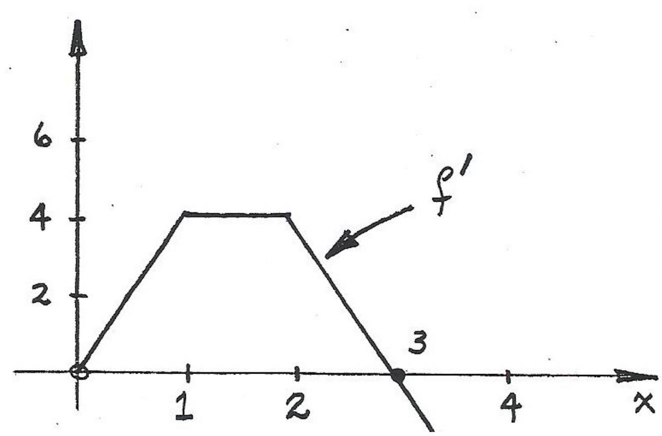
5. A ball is dropped from a tower 144 feet high. Its distance above the ground during its flight is given in feet and seconds by $S(t) = 144 - 16t^2$. What is its average distance above the ground during its flight?

6. The net worth of a company $f(t)$ is growing at a rate of $f'(t) = 2000 - 8t^2$ dollars per year, where t is in years since 1990. If the company is worth $40,000 in 1990, what is it worth in 2004?

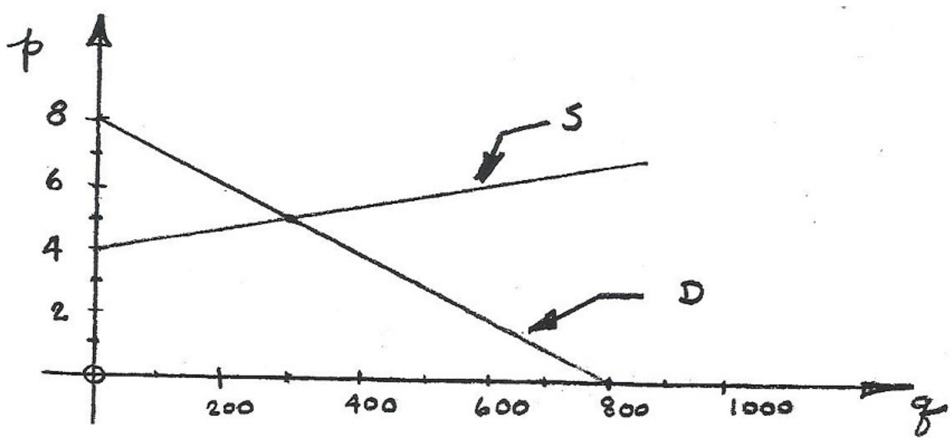
7. Find a formula for the area under the curve $y = x^2$ for $1 \le x \le t$ where t is any number greater than 1.



8. If $f'(x)$ is given by the graph below and $f(0) = 2$, calculate $f(4)$.



9. Suppose supply and demand curves are given in the graph below. **Estimate** the producer's surplus in this situation.



10. Suppose I save \$200 each week for 5 years at a rate of 4.5% annual interest compounded continuously. What is my approximate balance?

11. I want to buy a used car from Fast Freddie's Auto Emporium. The car costs \$20,000. I have a down payment of \$3,000 and I borrow \$17,000 at 9%/year compounded continuously for 4 years. What is my approximate monthly payment?

12. I borrow \$50,000 and I can afford to pay \$600 per month on a loan which has an interest rate of 5% per year compounded continuously. About how long will it take to pay off the loan?

13. Calculate: $\int_1^\infty \left(1+x^2\right)^{\frac{-3}{2}} x dx$

14. Suppose the marginal revenue of sales of q units of a product is $200-12\sqrt{q}$ /unit.

a. Find a formula $R(q)$ for the revenue function for the sale of q units.

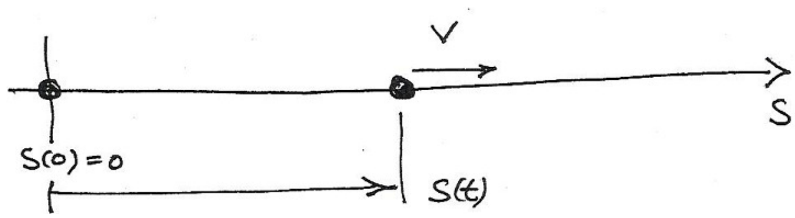
b. Determine $R(100)$.

c. Is <u>marginal revenue</u> increasing or decreasing at $q=100$? Substantiate your answer.

15. A cup of coffee at temperature $75^\circ C$ is placed outside on a winter day with temperature $0^\circ C$. The temperature $T(t)$ of the coffee decreases at a rate $-15e^{-0.2t}\,{}^\circ C/\min$. Write a formula for $T(t)$. Then, calculate $T(10)$.

16. Suppose a population $P(t)$ has a relative rate of change given by $\frac{1}{t+1}$ for $t \geq 0$ and $P(0)=100$. Determine a formula for $P(t)$ and calculate $P(100)$.

17.



Suppose an object moves to the right with velocity $V(t) = \frac{\ln(1+t)}{1+t}$, as illustrated. If it starts at the origin $S(0) = 0$, write an expression for its position $S(t)$ at time t. Then, determine $S(10)$.

18. Find the present and future value of an income stream of $12,000/year for 20 years. The interest rate is 7%, compounded continuously.

19. Calculate: $\int_1^2 7x^2 + 3x^{-1} dx$

20. Calculate: $\int e^{-0.05t} dt$

21. Calculate: $\int \frac{(\ln x)^2}{x} dx$

22. Calculate with integration by parts: $\int \ln(2x) dx$

23. Calculate with integration by parts: $\int xe^{-x} dx$

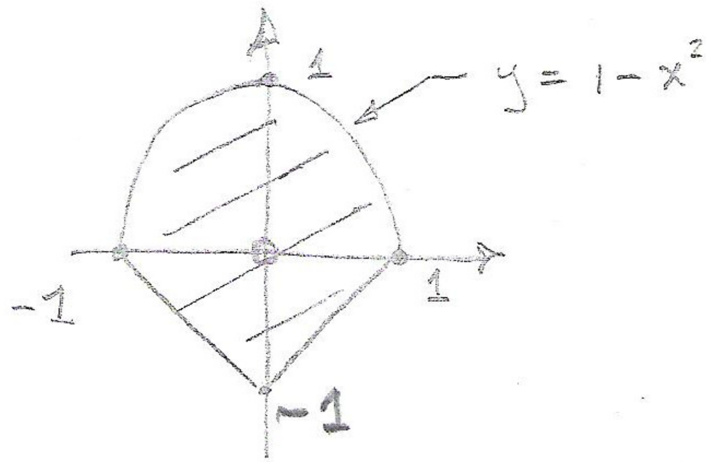
24. Calculate: $\int xe^{x^2} dx$

25. Calculate: $\int_0^\infty \frac{1}{\sqrt{x+1}} dx$

26. Calculate: $\int_0^\infty 3e^{-5x} dx$

27. Calculate: $\frac{d}{dx}\int_1^x 3^t dt$

28. Find the area of the region in the given graph:



29. Find the average value of $y = f(x) = x^2$ on the interval $[1,3] = \{x : 1 \le x \le 3\}$

30. Suppose I invest \$50/week in an account paying 4.5% annual interest compounded continuously. What is the balance in my account after 6 years?

31. If I borrow \$50,000 at 5.5% annual interest compounded continuously and can repay this amount at \$500/month, approximately how long does it take to repay this loan?

32. If the relative annual growth rate of a population is 4.5% and the present population is 20,000, what is the population in 3 years?

33. Suppose $V(t) = 10{,}000(1.07)^t$, calculate $\frac{V'(t)}{V(t)}$. (Recall: $b^t = e^{(\ln b)t}$)