Math 152

Show Your Work! March 10, 2009 Name _____

Good Luck! TEST #3 A (please print)

1. The half life of element Q is 3500 years. If a sample from an old basket contains only 12% of the original Q then how old is the basket? age of basket = _____ (of course show your work/calculations)

(6)

2. Differentiate. Circle your answers.

(a) $D\left(\arctan(2+e^x) \right) =$

(5)

(b) $\frac{d}{dx}\arcsin(3x+1) =$

(5)

(c) $D\left(arc\sec(x^3) \right) =$

(5)

3. Integrate -- show your work. Circle your answer.

(a) $\int 2x \cdot \cos(3x)\ dx =$

(7)

(b) $\int \sec(5x)\ dx =$

(7)

(c) $\int \frac{4}{1+(2x+3)^2}\,dx$ =

(7)

(d) $\int \frac{5}{\sqrt{16-x^2}}\,dx$ =

(7)

(e) $\int \frac{8x+33}{x^2+7x+6}\,dx$ =

(7)

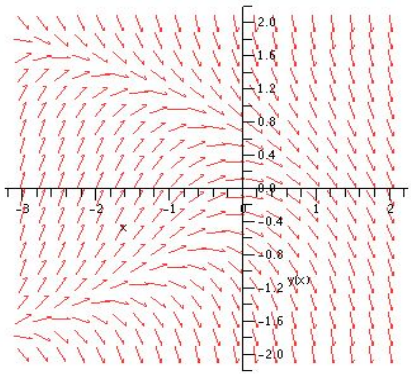
4. Write a valid Maple command to evaluate $\int_3^{\infty} \frac{7}{2+x^3}\,dx$

Maple:

(2)

5. On the direction field below, sketch the solution that goes through point A.

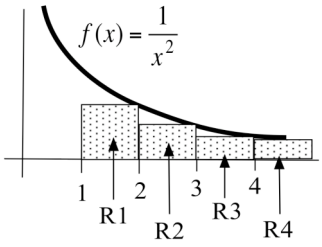
(3)



6. Use calculus to evaluate $\int_2^{\infty} \frac{6}{x^3}\,dx$ = _____

(8)

7. The diagram show rectangles Ri with bases on the x-axis and upper-right-hand corners on the graph of $f(x) = \frac{1}{x^2}$.

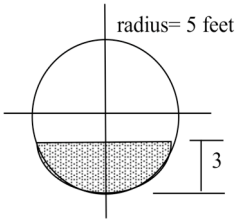


(2) height of R1 = _____ area of R1 = _____

(2) height of R2 = _____ area of R2 = _____

(4) Which is larger? (A) $\int_1^{\infty} \frac{1}{x^2}\,dx$ (B) R1+R2+R3+...= $\sum_{i=1}^{\infty} Ri$ (C) { (A) and (B) have the same value}

8. **Use your calculator** to determine the area of the bottom 3 feet of the circle with radius 5 feet (see diagram).



area = _____ (give 2 decimal places)

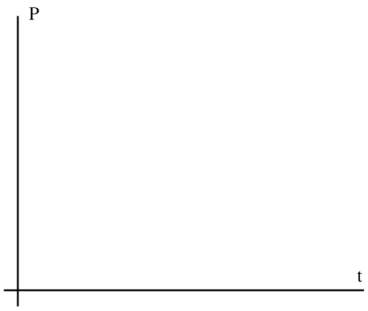
(This is something you would need to do to find how much heating oil is left in a tank.)

(4)

9. Write a differential equation that for the statement "the rate of change of the chemical in the reaction is proportional to the square root of the amount of the chemical present." Let R = the amount of the chemical present.

(4)

10. The rate of change of population P is described by the autonomous differential equation $\frac{dP}{dt} = -3 \cdot P \cdot (P - 12)$



(4) (a) What are the constant solutions? P = _____

(4) (b) Sketch the constant solutions and the solutions with initial values P(0)= 16 and P(0)=4.

(c) Solve the differential equation: $\frac{dP}{dt} = -3 \cdot P \cdot (P - 12) \qquad P(0) = 4$
(Find the constant C, but do not try to solve for P=) Circle your answer.

(8)

11. Biographies (1 point each)

(a) Even before Newton & Leibnitz invented the calculus, Archimedes could calculate
derivatives antiderivatives slopes volumes (circle one)

(b) Name one job John Kemeny had (besides being a math teacher): _____

the end! **Bonus** (+1 if correct) $\int_e^{\infty} \frac{5x^2 + 2}{\sqrt{x^8 + 3x}}\, dx$ is Finite Infinite (circle one)