

Test 1

Name: _____

Show your work! Answers that do not have a justification will receive no credit.

1. (20 points) Compute the following:

(a) $\int t^2 e^{t^3+1} dt$

(b) $\int x e^{5x} dx$

(c) $\int e^{2x} dx \sqrt{e^{2x} + 1}$

(d) $\int (s - 2) \cos(as) ds$ (Where a is a constant.)

(e) $\int_0^3 \sqrt{1 + 5z} dz$

2. (15 points) Let $\mathbf{v} = (1, 2)$ and $\mathbf{w} = (-3, 4)$. Then find:

(a) $2\mathbf{v} - 3\mathbf{w}$ and make a graph showing \mathbf{v} , \mathbf{w} and $2\mathbf{v} - 3\mathbf{w}$

(b) $\mathbf{v} \cdot \mathbf{w}$

(c) The unit vector in the direction of \mathbf{w}

(d) The angle between \mathbf{v} and \mathbf{w}

(e) Scalars r and s so that $r\mathbf{v} + s\mathbf{w} = (5, -4)$

(f) The work done if a force given by \mathbf{v} acts on an object displaced by \mathbf{w} .

3. (10 points) A particle starting at the point $P = (4, 2)$ moves in a straight line in the direction of the vector $\mathbf{v} = 3\mathbf{i} - \mathbf{j}$.

(a) Write a vector equation for the motion of the particle.

(b) Where does the particle hit the x -axis?

4. (10 points)(a) Write the solution to the initial value problem

$$w'(s) = \sqrt[6]{12 + 4s^4}, \quad w(3) = -17$$

as an integral.

(b) Solve the initial value problem $y' = \frac{x^2 + 1}{y^3}$, $y(1) = 0$.

5. (15 points) A particle moves so that its position vector is $\mathbf{r}(t) = (1 - t)\mathbf{i} + (t - t^3)\mathbf{j}$. Find the following

(a) The velocity of the particle

(b) The acceleration of the particle

(c) The speed of the particle.

6. (13 points) Find the volume if the curve part of the curve $y = ax(b - x)$ between $x = 0$ and $x = b$ is rotated about the x -axis.

7. (17 points) A fly lands on a piece of graph paper and moves so in the coordinates on the paper its position vector is $\mathbf{f}(t) = (1 - t, t - t^2)$ where t is the time in seconds since after it landed. After one second the fly is swatted by a calculus student who is using the graph paper to plot vectors while studying for a midterm.

(a) At what point did the fly land on the paper?

(b) At what point did the fly get squished?

(c) Sketch a graph of the path of the fly.

(d) What is the total distance the fly crawled while on the paper?