

Name: _____

Please show all work and justify your answers.

1. (30 pts.) Evaluate the following:

$$(a) \int_1^2 (x^2 + 1) dx \quad (b) \int_0^1 \sqrt{2x+1} dx \quad (c) \int_0^3 |x-1|^3 dx$$

$$(d) \frac{d}{dx} \int_1^x \sqrt{3 + \sin(t)} dt \quad (e) \frac{d}{dx} \int_{x^2}^{x^3} \sqrt{2 + \cos(t)} dt$$

2. (10 pts.) Let $f(x) = 1 + 2x + x^2 - x^3$.

(a) Find the critical points of f . On which intervals is f decreasing?

(b) Find the inflection points of f . On which intervals is f concave up?

3. (10 pts.) Find point(s) on the hyperbola $xy = -16$ closest to the origin. Sketch.

4. (10 pts.) Solve the differential equation $w'(t) = w(t)^2(t + 1)$ subject to the initial condition $w(0) = 2$. Sketch the solution.

1	2	3	4	total (60)	(%)