Mathematics 141 Test #3 Name: _____

Show your work to get credit. An answer with no work will not get credit.

(1) (35 points) Compute the following antiderivatives.

(a) $\int (5x^4 - 12x^3 + 6x^2 - 4x + 1)\,dx$ _____

(b) $\int (2\cos\theta + 3\sin\theta)\,d\theta$ _____

(c) $\int 2\sqrt{v}\,dv$ _____

(d) $\int \frac{3}{t^3}\,dt$ _____

(e) $\int \frac{5s^2 - 3s}{s^4}\,ds$ _____

(f) $\int x\sqrt{x^2+4}\,dx$ _____

(g) $\int \frac{\cos\theta}{(4+\sin\theta)^2}\,d\theta$ _____

(h) $\int (y^2+1)\sqrt{y^3+3y+1}\,dy$ _____

(2) (20 points) Compute the following definite integrals.

(a) $\int_1^2 (6x^2 - 4x + 1)\, dx$ _____

(b) $\int_1^3 \sqrt{t+1}\, dt$ _____

(c) $\int_0^\pi \sin(\theta/2)\, d\theta$ _____

(d) $\int_{-1}^2 \dfrac{3x\, dx}{(x^2+4)^2}$ _____

(3) (5 points) Find the function $F(x)$ such that $F'(x) = 1 + 2x$ and $F(3) = 2$.

$F(x) =$ _____

(4) (5 points)

(a) Is $y = x + 1$ a solution to $y' = y - x$? Show work

(b) Is $y = x$ a solution to $y' = x + y$? Show work

(5) (5 points) Solve $\frac{dy}{dx} = -\frac{3x}{4y}$, and $y(2) = 3$.

(6) (5 points) Compute $\sum_{k=2}^{5}(3k - 2)$.

(7) (10 points)

(a) State the mean value theorem.

(b) Show that $|\sin(3b) - \sin(3a)| \leq 3|b - a|$.

(8) (10 points) Let $f(x) = \begin{cases} x - 1, & 0 \leq x \leq 3; \\ 2, & 3 < x \leq 6. \end{cases}$.

(a) Graph $y = f(x)$.

(b) Find $\displaystyle\int_0^6 f(x)\,dx$.

(9) (10 points) Compute the following:

(a) $\dfrac{d}{dx}\displaystyle\int_1^x \cos(3t^2)\,dt$

(b) $\dfrac{d}{dx}\displaystyle\int_3^{x^2+1} \sqrt{t+1}\,dt$