1.[12 points] [Calculators are not allowed on this question] Let $f(x) = xe^x$ and let $F(x)= xe^x – e^x +\pi$. Show by differentiating F(x) that F is an anti-derivative of f. Show *all* your work.

2.[16 points] Let $F(x) = \int_1^{\cos x} e^{\sin t}dt$

(a)Find F′(x)

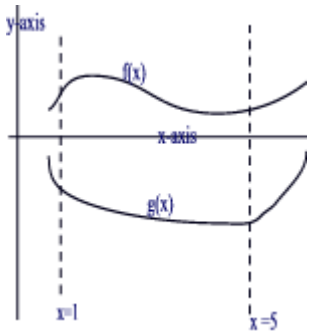
(b)Find F(2π)

3.[12 points] If $\int_1^7 f(x)dx = 19$ and $\int_1^5 f(x)dx = 25$ find:

(a) $\int_5^7 f(x)dx$

(b) $\int_1^5 3f(x)dx$

4.[12 points] If $0 \le f(x)$ and $g(x) \le 0$ for $1 \le x \le 5$, $\int_1^5 f(x)dx = 10$, and $\int_1^5 g(x)dx = -30$. The graph looks like:



Find

(a) The area of the region bounded by x = 1, x = 5, y = f(x), and y = g(x)

(b) $\int_1^5 |g(x) - f(x)|dx$

(c) $\int_1^5 (g(x) + f(x))dx$

5.[10 points] Use the substitution rule to show that

$$\int_0^{10} x^2 e^{x^3} dx = \frac{1}{3}\int_0^{1000} e^u du$$

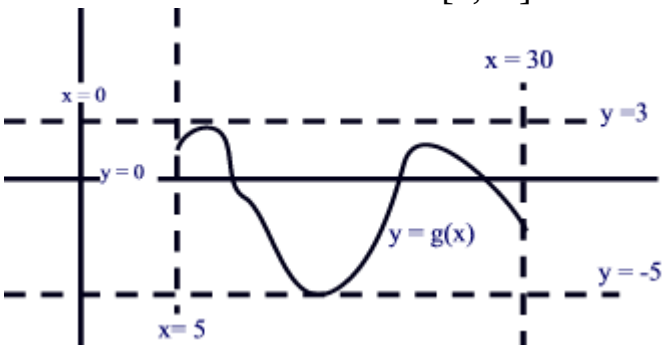
6.[10 points] Let R be the region of the plane bounded by $y = x^2 + 2$ and $y = x^3+2$. Find the area of R.

7.[10 points] Let R be the region of the plane bounded by $y^2 - 2 = x$ and $y = x$. Find the area of R.

8.[20 points] From the top of a 192 feet tall building a ball is thrown up with an initial velocity of 64 ft/sec. The acceleration due to gravity is -32 ft/sec^2. Assuming that the only force acting on the ball is gravity find:

(a) The velocity function.
(b) The position function.
(c) The time the ball takes to reach the ground.
(d) The total distance traveled by the ball.
(e) The displacement of the ball.

[10 points]Let g(x) be a continuous function on [5, 30] and with g having an absolute minimum of -5 and an absolute maximum of 3 on [5,30]. So that the graph looks like:



Show that:

(a) $-125 \leq \int_5^{30} g(x)dx \leq 75$

(b) $0 \leq \int_5^{30} |g(x)|dx \leq 125$