

ESP  
Kouba  
Worksheet 8

1.) The rate at which the amount of money in your savings account increases is proportional to the amount of money present. If you initially deposit \$750 (with no deposits thereafter), and after one year the amount of money has increased by 12%, how much money will be in your account after 20 years ?

2.) The amount of money in your savings account increases by 12% each year. If you initially deposit \$750 (with no deposits thereafter), how much money will be in your account after 20 years ?

3.) Use differentials to estimate each of the following.

a.)  $f(1.01) - f(1)$ , where  $f(x) = \frac{\sqrt{x}}{1 + \sqrt{x}}$

b.)  $g(\sqrt{\pi} - 1/10) - g(\sqrt{\pi})$ , where  $g(x) = \sin(x^2)$

c.)  $h(7.99)$ , where  $h(x) = \frac{x^{1/3}}{1 + x}$

d.)  $(33)^{1/5}$

4.) Let  $G(x) = \int_0^x \arctan(t^{1/4}) dt$ .

a.) Compute  $G'(x)$ .

b.) Give a good estimate for each of the following.

i.  $G(1.01) - G(1)$

ii.  $G(1.98) - G(2)$

iii.  $G(\sqrt{3} + 1/100) - G(\sqrt{3})$

5.) Integrate.

$$a.) \int e^x dx$$

$$b.) \int \frac{1}{e^x} dx$$

$$c.) \int \frac{e^x}{1+e^x} dx$$

$$d.) \int \frac{e^x+1}{e^x} dx$$

$$e.) \int \frac{1}{1+e^x} dx$$

$$f.) \int x e^x dx$$

$$g.) \int x^2 e^x dx$$

$$h.) \int x e^{x^2} dx$$

$$i.) \int x^2 e^{x^2} dx$$

$$j.) \int x^2 e^{x^3} dx$$

$$k.) \int \sqrt{x} dx$$

$$l.) \int \frac{1}{\sqrt{x}} dx$$

$$m.) \int \frac{\sin \sqrt{x}}{\sqrt{x}} dx$$

$$n.) \int \sqrt{1-x} dx$$

$$o.) \int x \sqrt{1-x} dx$$

$$p.) \int x \sqrt{1-x^2} dx$$

$$q.) \int \frac{1+\sqrt{x}}{\sqrt{x}} dx$$

$$r.) \int \frac{(1+\sqrt{x})^{10}}{\sqrt{x}} dx$$

$$s.) \int \frac{1}{\sqrt{x-1}} dx$$

$$t.) \int \frac{1}{\sqrt{1-x^2}} dx$$

$$u.) \int \frac{1}{1 \times 1 \sqrt{x^2-1}} dx$$

$$v.) \int \frac{x}{\sqrt{1-x^2}} dx$$

$$w.) \int \sin \theta d\theta$$

$$x.) \int \sin^4 \theta \cos \theta d\theta$$

$$y.) \int (1 + \tan \theta)^2 d\theta$$

$$z.) \int \frac{\sec^2(\ln(e^{1+\sqrt{x}}))}{2\sqrt{x}} dx$$

6.) Assume that  $f''$  is continuous,  $f(0) = f(1)$ , and  $f'(1) = 3$ . Evaluate

$$\int_0^1 x f''(x) dx .$$

7.) Find all functions  $f(x)$  satisfying each of the following equations.

$$a.) f'(x) = x [f(x)]^4$$

$$b.) f(x) = 3 \int_0^x f(t) dt .$$