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Math 152-512

Assignment 2 (ch5: 11, 12, 14, 15; ch6: 1, 2)

Chapter 5:

11)

```
> restart;
```

```
Warning, the name changecoords has been redefined

Warning, the protected names norm and trace have been redefined and unprotected
```

```
> with(student):
```

```
> f:=x->x / (x^6 + 1);
```

$$f := x \to \frac{x}{x^6 + 1}$$

```
> Int(f(x), x);
```

$$\int \frac{x}{x^6 + 1}\, dx$$

```
> value(%);
```

$$\frac{1}{6}\ln(x^2 + 1) - \frac{1}{12}\ln(x^4 - x^2 + 1) + \frac{1}{6}\sqrt{3}\,\arctan\left(\frac{1}{3}(2x^2 - 1)\sqrt{3}\right)$$

12)

```
> f:=x->tan(sqrt(x)) / (2 * sqrt(x));
```

$$f := x \to \frac{1}{2}\frac{\tan(\sqrt{x})}{\sqrt{x}}$$

```
> Int(f(x), x);
```

$$\int \frac{1}{2}\frac{\tan(\sqrt{x})}{\sqrt{x}}\, dx$$

```
> value(%);
```

$$-\ln(\cos(\sqrt{x}))$$

14)

```
> f:=x->(x^3 + x)/ sqrt(1 + x^2);
```

$$f := x \to \frac{x^3 + x}{\sqrt{1 + x^2}}$$

```
> Int(f(x), x=-1..3);
```

$$\int_{-1}^{3} \frac{x^3 + x}{\sqrt{x^2 + 1}}\, dx$$

```
> value(%);
```

$$\frac{10}{3}\sqrt{10} - \frac{2}{3}\sqrt{2}$$

15)

```
> f:=x->sqrt((tan(x))^2 + 1);
```

$$f := x \to \sqrt{\tan(x)^2 + 1}$$

```
> Int(f(x), x = -Pi/4 .. Pi/4);
```

$$\int_{-1/4\,\pi}^{1/4\,\pi} \sqrt{\tan(x)^2 + 1}\, dx$$

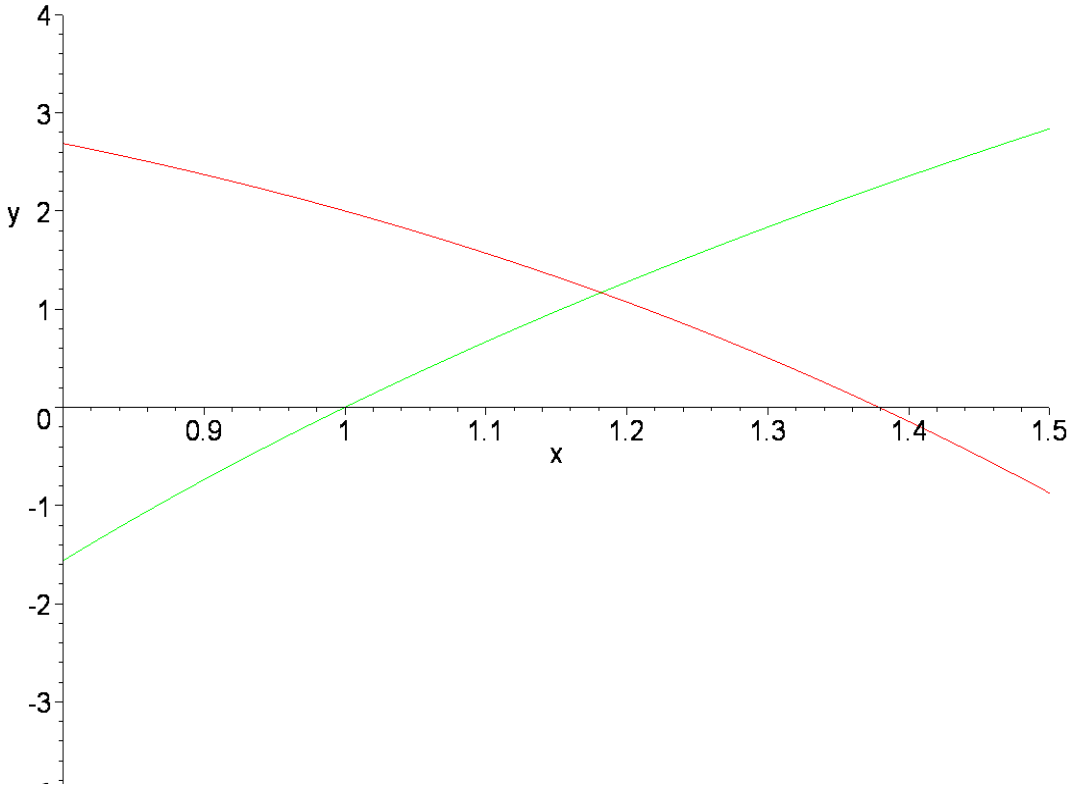
```
> value(%);
```

$$2\ln(1 + \sqrt{2})$$

Chapter 6

1)

```
> f0:=7 * ln(x): f1:=4 - x^3 - x:
> plot({f0, f1}, x=0.8..1.5, y = -4..4);
```




```
> intersection:=fsolve(f0=f1, x);
```

$$intersection := 1.181653024$$

```
> f0_intersection := fsolve(f0, x);
```

$$f0\_intersection := 1.$$

```
> f1_intersection := fsolve(f1, x);
```

$$f1\_intersection := 1.378796700$$

```
> Int(f1-f0, x= f0_intersection .. intersection) + Int(f0-f1, x =
  intersection .. f1_intersection);
```

$$\int_{1.}^{1.181653024} 4 - x^3 - x - 7\ln(x)\,dx + \int_{1.181653024}^{1.378796700} 7\ln(x) - 4 + x^3 + x\,dx$$

```
> value(%);
```

$$.4014402773$$

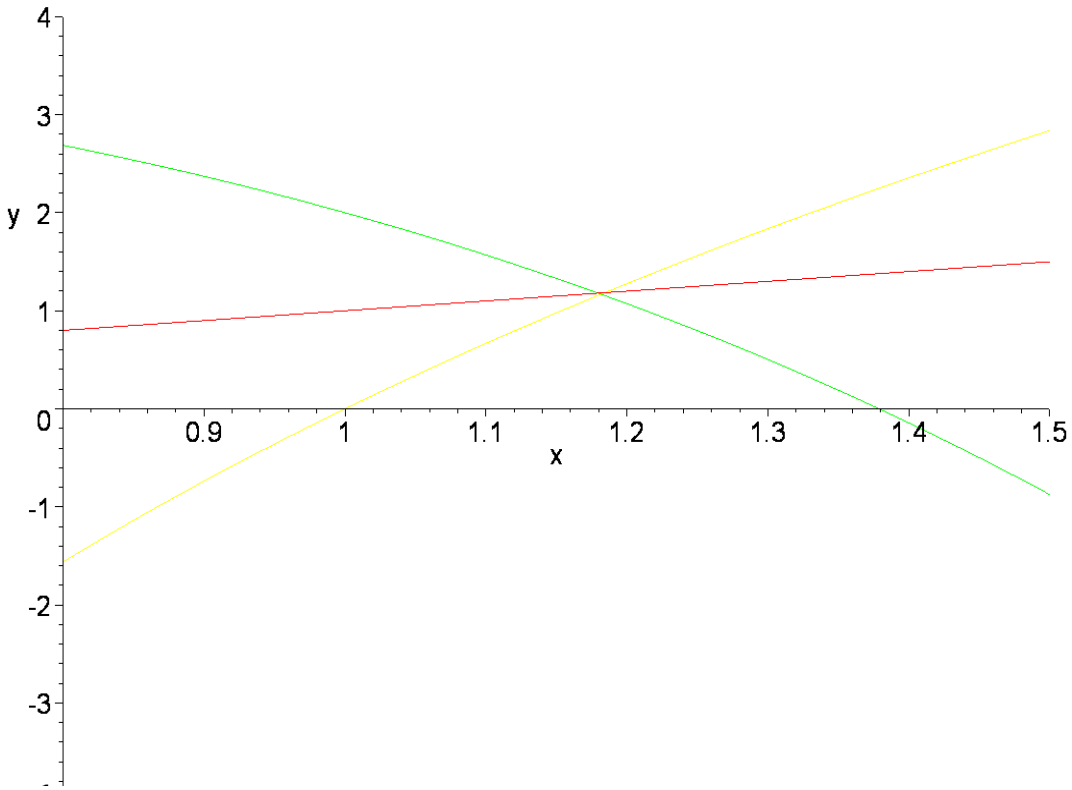
2)

(a)

```
> rotational_line := x;
```

$$rotational\_line := x$$

```
> plot({f0, f1, rotational_line}, x=0.8..1.5, y=-4..4);
```




```
> Int(Pi*((f1-f0)^2 - (rotational_line - f0)^2), x = f0_intersection
  .. intersection) + Int(Pi*((f0-f1)^2 - (rotational_line - f1)^2),
  x = intersection .. f1_intersection);
```

$$\int_{1.}^{1.181653024} \pi\left((4 - x^3 - x - 7\ln(x))^2 - (x - 7\ln(x))^2\right)dx$$

$$+\int_{1.181653024}^{1.378796700} \pi\left(\left(7\ln(x)-4+x^3+x\right)^2-\left(2x-4+x^3\right)^2\right)dx$$

(b)

>