5.4 The Fundamental Theorem of Calculus

Part 1

RS #29: $\frac{d}{dx}\int_c^x f(t)\,dt = f(x)$

Find $\frac{dy}{dx}$

1. $y = \int_{\pi}^{x} \cos t\,dt$

2. $y = \int_{-1}^{x} (t^2 + t - 1)\,dt$

3. $y = \int_{4}^{x^2} e^t\,dt$

4. $y = \int_{2x}^{x^2} \sin t\,dt$

5. $y = \int_{e^x}^{x^2} \ln t\,dt$

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Part 2

$$\int_a^b f(x)dx = [F(x)]^b_a = F(b) - F(a)$$

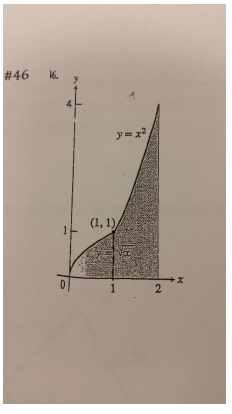
Find the total area between the curve and the x-axis analytically. Support your answers graphically.

6. $\int_1^4 x^{\frac{2}{3}} dx$

7. $\int_0^2 \frac{\sqrt{x}+3}{\sqrt{x}} dx$

8. $y = 4 - x^2,\ [0,3]$

9. $y = x^3 - 4x,\ [-2,2]$



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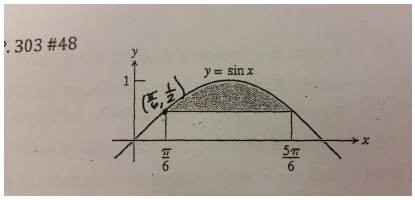

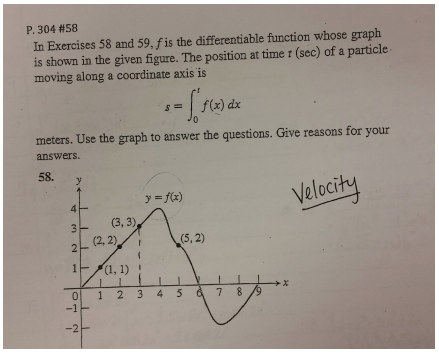

a) What is the particle's velocity at time t=5?

b) Is the acceleration of the particle at time t=5 positive or negative?

c) What is the particle's position at time t=3?

d) At what time during the first 9 sec does s have its largest value?

e) Approximately when is the acceleration zero?

f) When is the particle moving toward the origin? away from the origin?

g) On which side of the origin does the particle lie at time t=9?