TEST REVIEW

① $3x + x^2 + \frac{4}{x} + C$

② $-2\cos x - \sin x + C$

③ $\int \left(4x\sqrt{x} + \frac{4x}{x^2}\right)dx = \int \left[4x^{3/2} + 4\left(\frac{1}{x}\right)\right]dx$

$= \frac{8}{5}x^{5/2} + 4\ln|x| + C$

④ $\int_{-4}^{4} f(x)dx = 2\int_{0}^{4} f(x)dx = 2(9\pi) = 18\pi$

⑤ $\int_{-4}^{4} g(x)dx = 0$

⑥ $\int_{-4}^{4} g(x)dx - \int_{-4}^{4} f(x)dx = 0 - 18\pi = -18\pi$

⑦ $3\int_{0}^{4} f(x)dx + \int_{0}^{4} dx = 3(9\pi) + [x]_0^4 = 27\pi + 4$

⑧ $-\int_{0}^{4} f(x)dx - \int_{0}^{4} g(x)dx = -9\pi - 12$

⑨ $-\int_{0}^{4} f(x)dx + \int_{0}^{4} g(x)dx = -9\pi + 12$

⑩ $\left[3\sin x + \cos x\right]_0^{\pi/4} = \left(3\sin\frac{\pi}{4} + \cos\frac{\pi}{4}\right) - \left(3\sin 0 + \cos 0\right)$

$= \frac{3}{\sqrt{2}} + \frac{1}{\sqrt{2}} - 1 = \frac{4}{\sqrt{2}} - 1 = 2\sqrt{2} - 1$

⑪ $\left[2x + \cos x\right]_0^{\pi/6} = \left(\frac{\pi}{3} + \cos\frac{\pi}{6}\right) - \left(0 + \cos 0\right)$

$= \frac{\pi}{3} + \frac{\sqrt{3}}{2} - 1$

(12) $\int_1^9 \frac{3}{2\sqrt{x}}\,dx = 3\int_1^9 \frac{1}{2\sqrt{x}}\,dx = 3\left[\sqrt{x}\right]_1^9 = 3(3-1) = 6$

(13) $f(0) - f(-2) = 11 - (-5) = 16$

(14) $f'(1) - f'(-2) = 1 - 4 = -3$

(15) $\int_0^2 f''(x)\,dx - \frac{2}{3}\int_0^2 f'(x)\,dx = \left[f'(2) - f'(0)\right] - \frac{2}{3}\left[f(2) - f(0)\right]$

$= 0 - (-9) - \frac{2}{3}(12 - 11) = 9 - \frac{2}{3} = \frac{25}{3}$

(16) a) in/hr^2 b) inches c) inches d) inches per hour

(17) a) $\frac{1}{2}\int_1^3 v(t)\,dt = 2.5$

b) $\frac{v(3) - v(1)}{2} = -1.25$

c) $-3 + \int_0^4 v(t)\,dt = 1$

d) $\int_0^5 |v(t)|\,dt \approx 22.950$

e) $[0, 1.633) \cup (3.051, 5]$

(18) a) $\frac{80 - 88}{1.25 - .75} = -16$ km/hr^2

b) $\frac{v(2) - v(0)}{2} = \frac{50 - 0}{2} = 25$ km/hr^2

c) $\frac{p(2) - p(0)}{2}$ or $\frac{1}{2}\int_0^2 v(t)\,dt$

Cannot be determined exactly but could be approximated using a Riemann sum

d) $\int_0^2 |v(t)|dt$ cannot be determined exactly without knowing the velocity equation, but assuming the vehicle only moves forward, could be approximated with a Riemann sum.

e) Net distance (km) traveled (change in position) by the vehicle during the two-hour interval

f) The average velocity of the vehicle during the two-hour interval (km/hr)

g) $0.5(45) + 0.5(88) + 0.5(80) + 0.5(58) = 135.5$ km

h) $0.5(72) + 0.5(95) + 0.5(62) + 0.5(50) = 139.5$ km

(19) $\frac{1}{\pi}\int_0^{\pi} (x^2 - \sin x)dx = \frac{1}{\pi}\left[\frac{x^3}{3} + \cos x\right]_0^{\pi}$

$= \frac{1}{\pi}\left[\left(\frac{\pi^3}{3} + \cos\pi\right) - (0 + \cos 0)\right]$

$= \frac{1}{\pi}\left(\frac{\pi^3}{3} - 1 - 1\right) = \frac{1}{\pi}\left(\frac{\pi^3}{3} - 2\right) \approx 2.653$

(20) a) $f(3) - f(0) = \int_0^3 f'(x)dx = \frac{9\pi}{4}$

b) $f(5) - f(-3) = \int_{-3}^5 f'(x)dx = \frac{9\pi}{2} - \frac{\pi}{2} = \frac{8\pi}{2} = 4\pi$

c) $\int_4^6 f'(x)dx = -\frac{\pi}{4} - \frac{1}{2} = f(6) - f(4)$

$-\frac{\pi}{4} - \frac{1}{2} - \frac{3\pi}{4} = -f(4)$

$f(4) = \pi + \frac{1}{2}$

d) $20 = \int_0^7 f'(t)dt + \int_7^{10} f'(t)dt$

$20 = \frac{9\pi}{4} - \frac{\pi}{2} - 2 + \int_7^{10} f'(t)dt$ $\qquad \int_7^{10} f'(t)dt = 22 - \frac{7\pi}{4}$