(20pts) NAME (printed neatly): _____
(10pts) Section Number (circle correct section): 502 (10:20am) 503 (11:30am) 506 (4:10pm)

1. (10pts) The marginal revenue for gadgets made by the Gadget Gig is $R'(x) = 133x^{\frac{4}{3}}$ dollars per gadget for x gadgets produced and sold, $0 \le x \le 50$. Find the average value of the marginal revenue from 8 gadgets to 27 gadgets.

$$\frac{\int_8^{27}\left(133x^{\frac{4}{3}}\right)dx}{27-8} =$$

$$\frac{1}{19}\left(133\left(\frac{3}{7}\right)x^{\frac{7}{3}}\right)\Bigg|_8^{27} =$$

$$\frac{1}{19}\left(57x^{\frac{7}{3}}\right)\Bigg|_8^{27} =$$

$$\frac{1}{19}\left(57(27)^{\frac{7}{3}} - 57(8)^{\frac{7}{3}}\right) = \frac{1}{19}(117363) = 6177$$

The average value of the marginal revenue from the production of 8 to 27 gadgets is about $6177.00 dollars per gadget.

2. (10pts) $\int_{-\infty}^{-2}\left(3x^{-4}+5\right)dx =$

$$\lim_{N\to-\infty}\left(\int_N^{-2}\left(3x^{-4}+5\right)dx\right) =$$

$$\lim_{N\to-\infty}\left(\left(-x^{-3}+5x\right)\Big|_N^{-2}\right) =$$

$$\lim_{N\to-\infty}\left(\left(-(-2)^{-3}+5(-2)\right)-\left(-(N)^{-3}+5(N)\right)\right) =$$

$$\lim_{N\to-\infty}\left(\frac{1}{8}-10+N^{-3}-5N\right) =$$

$$\lim_{N\to-\infty}\left(\frac{-79}{8}+N^{-3}-5N\right) =$$

$$\lim_{N\to-\infty}\frac{-79}{8}+\lim_{N\to-\infty}N^{-3}-\lim_{N\to-\infty}5N =$$

$$\frac{-79}{8}+0-\lim_{N\to-\infty}5N \to \infty$$

Therefore $\int_{-\infty}^{-2}\left(3x^{-4}+5\right)dx \to \infty$

3. $y = -4\sin(6x+3)-8$ (as compared with y = sin (x))

(5pts) amplitude = |–4| = 4

(5pts) period = $\frac{2\pi}{6} = \frac{\pi}{3}$

(5pts) reflected across x-axis (yes or no): YES

(5pts) vertical shift (up or down and by how much): down 8

(5pts) horizontal shift (right or left and by how much): $\frac{|h|}{b} = \frac{3}{6} = \frac{1}{2}$; left $\frac{1}{2}$

4. (25pts) On a small planet a pebble is thrown down off a 300-meter building with initial velocity of 5 meters per second. If acceleration due to gravity is –3.6 meters per second squared, in how many seconds, to 2 decimal places, would the pebble hit the ground?

$a(t) = -3.6\frac{m}{s^2}$

$v(t) = \int a(t)dt = \int(-3.6)dt = -3.6t + C$

$v(0) = -3.6(0) + C = -5$

$C = -5$

$v(t) = -3.6t - 5 \quad \frac{m}{s}$

$s(t) = \int v(t)dt = \int(-3.6t - 5)dt = \frac{-3.6}{2}t^2 - 5t + D = -1.8t^2 - 5t + D$

$s(0) = -1.8(0^2) - 5(0) + D = 300$

$D = 300$

$s(t) = -1.8t^2 - 5t + 300 \quad meters$

$s(t) = 0$

$-1.8t^2 - 5t + 300 = 0$

$y1 = -1.8t^2 - 5t + 300$

zero

$t \approx 11.595551$

After about 11.60 seconds the pebble will hit the ground.